ELECTRICAL REVIEW

'ENGLISH ELECTRIC'

h.r.c. fuse links

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2.

Fusegear Division, East Lancashire Road, Liverpool 10

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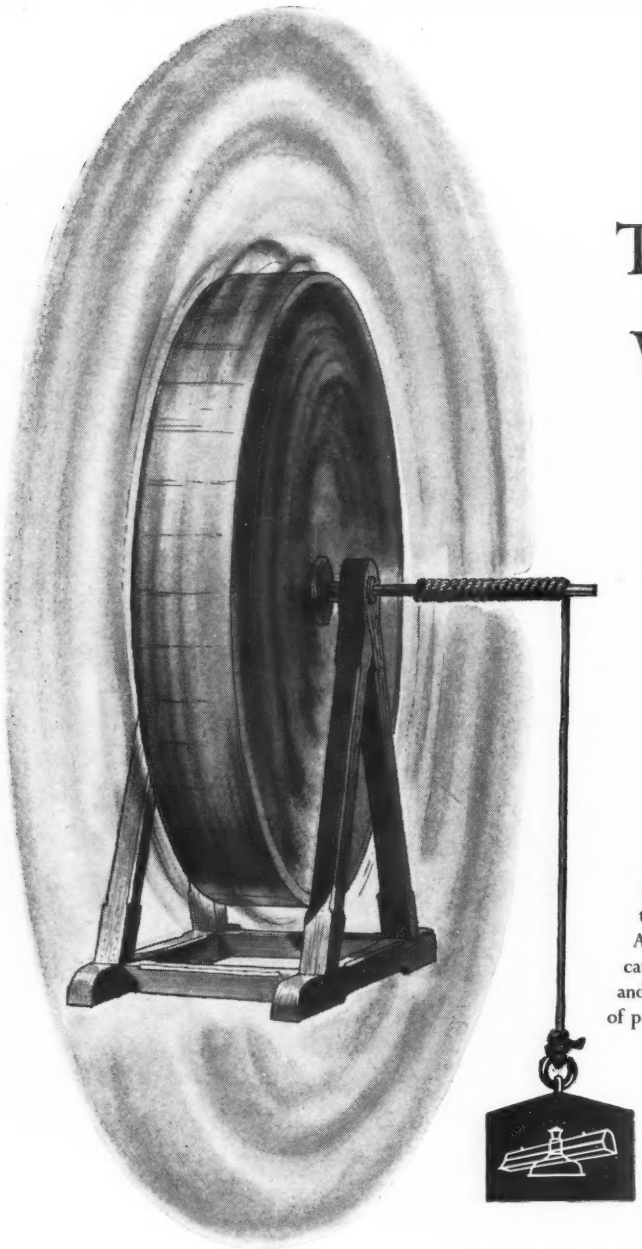

The Wheel Of Orffyreus

In the 18th century
Johann Ernest Elias Bessier—
known as Orffyreus—invented a wheel that,
once started, went on and on . . . and on.
Between 1712 and 1717 Orffyreus made four
such wheels, the last subjected to rigid
examination by scientists and experts,
then placed in an empty, sealed room
for two months. On re-entry
the wheel was found, still spinning.
A fit of rage over continuing scepticism
caused Orffyreus to smash his invention
and he died in 1745, taking his secret
of perpetual motion with him.

In a similar manner Benjamin lighting fittings
last indefinitely. The 'Crysteel' vitreous enamel
finish will not deteriorate but will give
ideal economic lighting year after year.
Write today for full details
of the Benjamin range of lighting fittings.

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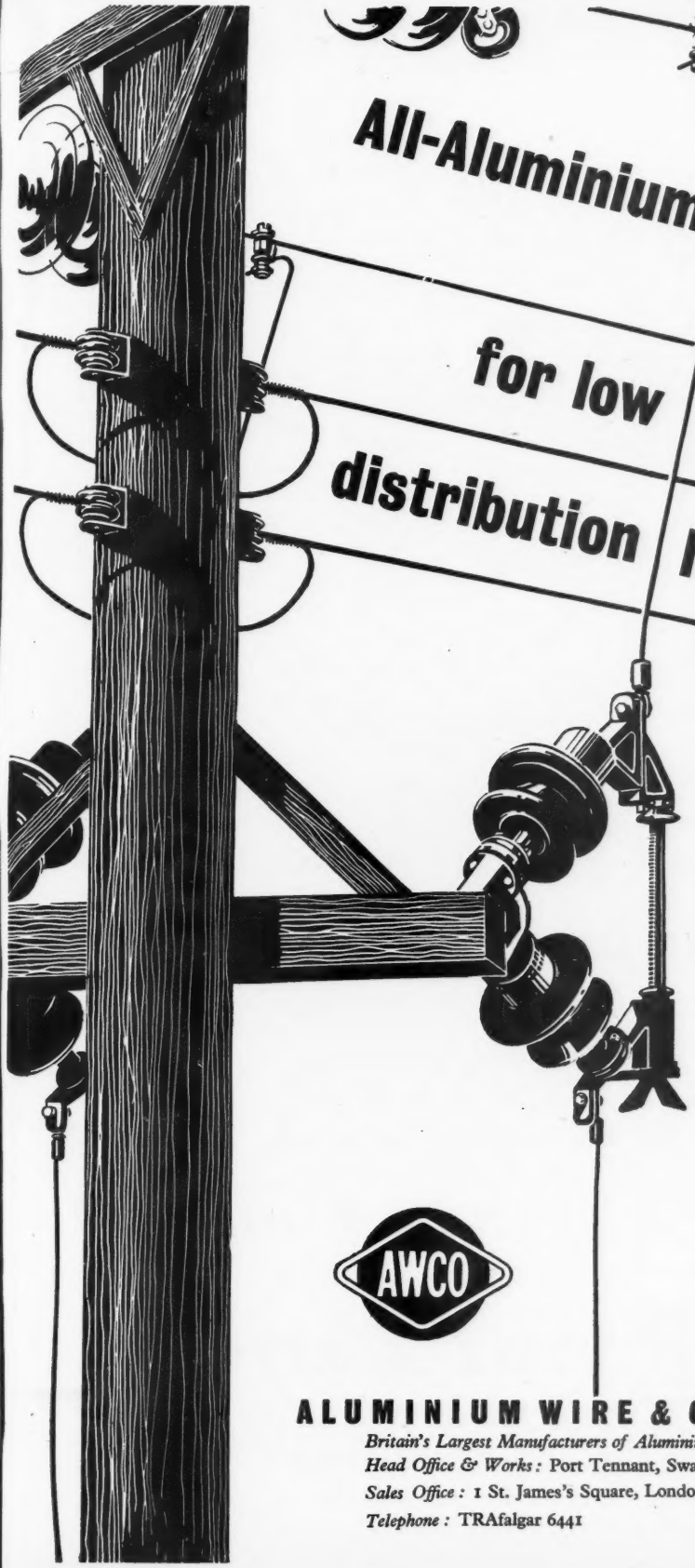

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we'll see you in Torquay . . .

where we shall be pleased to welcome you on the Venner stands to see the improvements to our existing range of time switches. In addition, the tried and tested Venner Park-O-Meter will be demonstrated.

. . . Stands 9 and 10

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Associated Companies: Venner Accumulators Ltd.; Venner Electronics Ltd.

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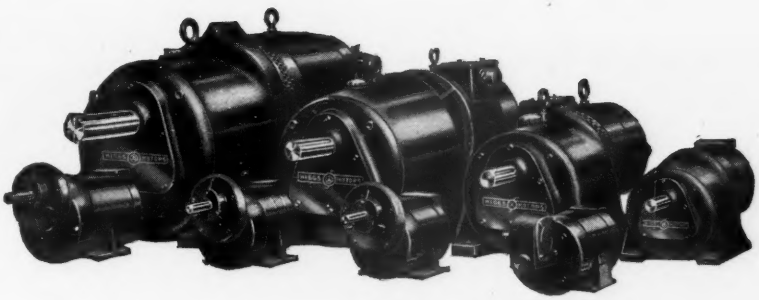

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A free replacement for any standard straight Osram tube which fails under normal service conditions before 3,000 hours or one year of use whichever is the shorter. This guarantee covers all Osram tubes from 1½ ft.-8 ft., 15w-125w.

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BECAUSE a stringent testing schedule is applied at all stages in the manufacture of Osram guaranteed tubes.

BECAUSE unique manufacturing processes are used in making Osram guaranteed tubes. These techniques are designed to eliminate early failures and ensure superb maintenance of lighting efficiency throughout a long life

Osram **GUARANTEED TUBES**

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They never let you down

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The policeman patrolling his beat is backed by many specialist departments. In an emergency, a 'phone call will quickly bring an ambulance to the scene or put a police car on the track of a stolen car or wanted person. Special police telephone boxes and radio-controlled cars enable the police to be on the spot in a matter of minutes. They never let you down.

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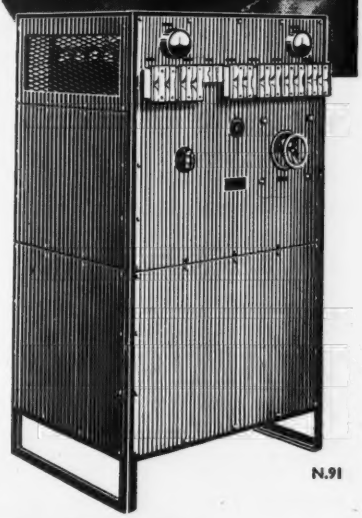

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NIFE-NEVERFAYLE

THE EMERGENCY LIGHTING EQUIPMENT WITH THE **STEEL** ALKALINE BATTERY

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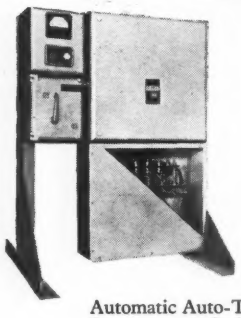
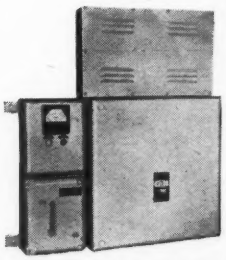
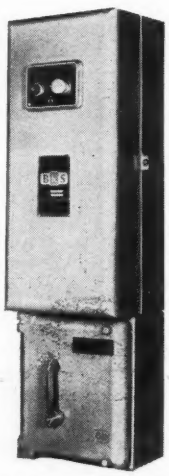
BKS RANGE OF AUTOMATIC MOTOR STARTERS



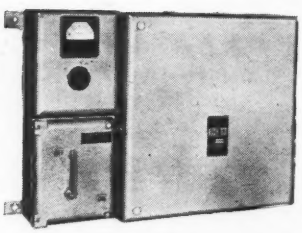
Automatic Auto-Transformer Starters. Suitable for controlling motors up to 40 h.p. **LIST AT 60**



Automatic Stator Rotor Starters. Suitable for controlling slip ring motors up to 40 h.p. **LIST SR 60**



Heavy Duty Direct-On-Line Starters. Suitable for controlling motors up to 30 h.p. **LIST DO 60**



Heavy Duty Automatic Star-Delta Starters. Suitable for controlling motors up to 55 h.p. **LIST SD 60**

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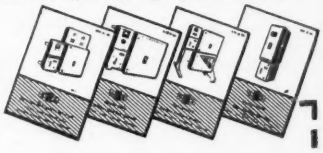
Send for these leaflets



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Indicate by tick which List/s required

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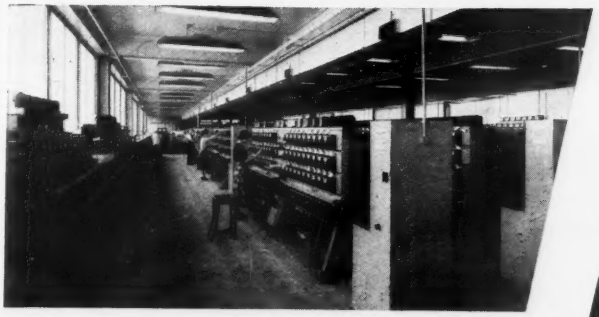

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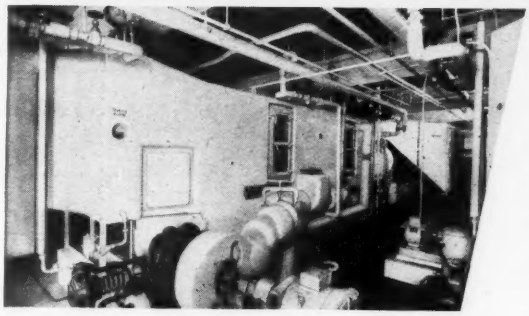

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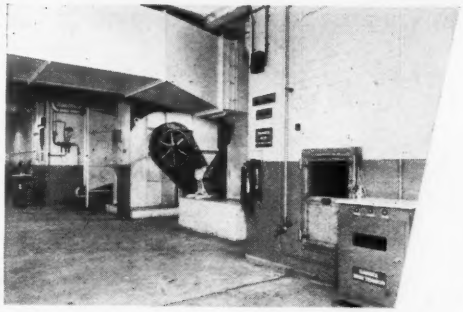

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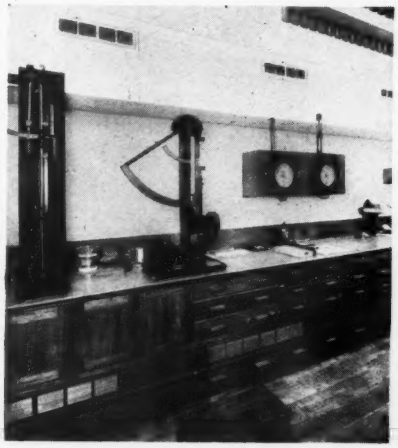

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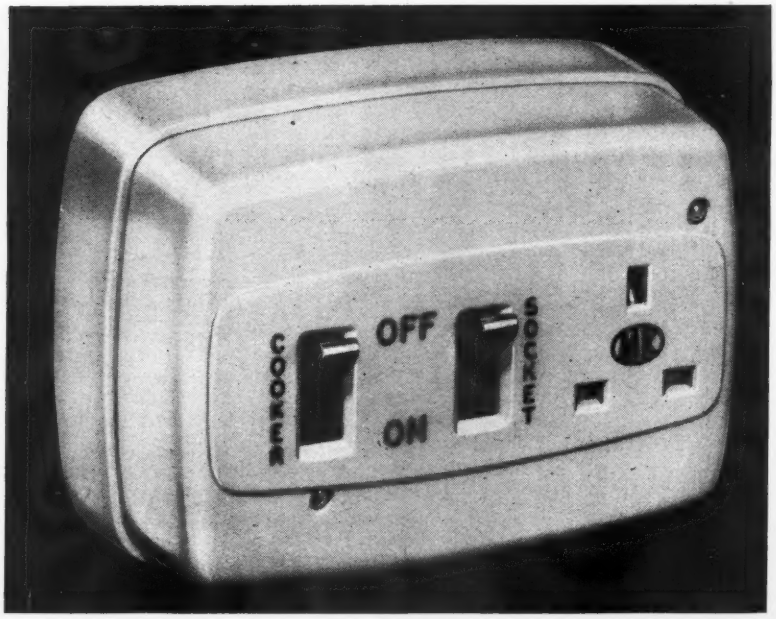

List No. 5040/646 *30 amp double pole AC surface cooker control unit with 13 amp double pole switchsocket-outlet, all-insulated pattern, ivory finish. Complete with ivory 13 amp fused plug,* **28/8** *each*

Also available with twin neon pilot-lights, **List No. 5041/646.** *Complete with two lamps and ivory 13 amp fused-plug,* **38/-** *each*

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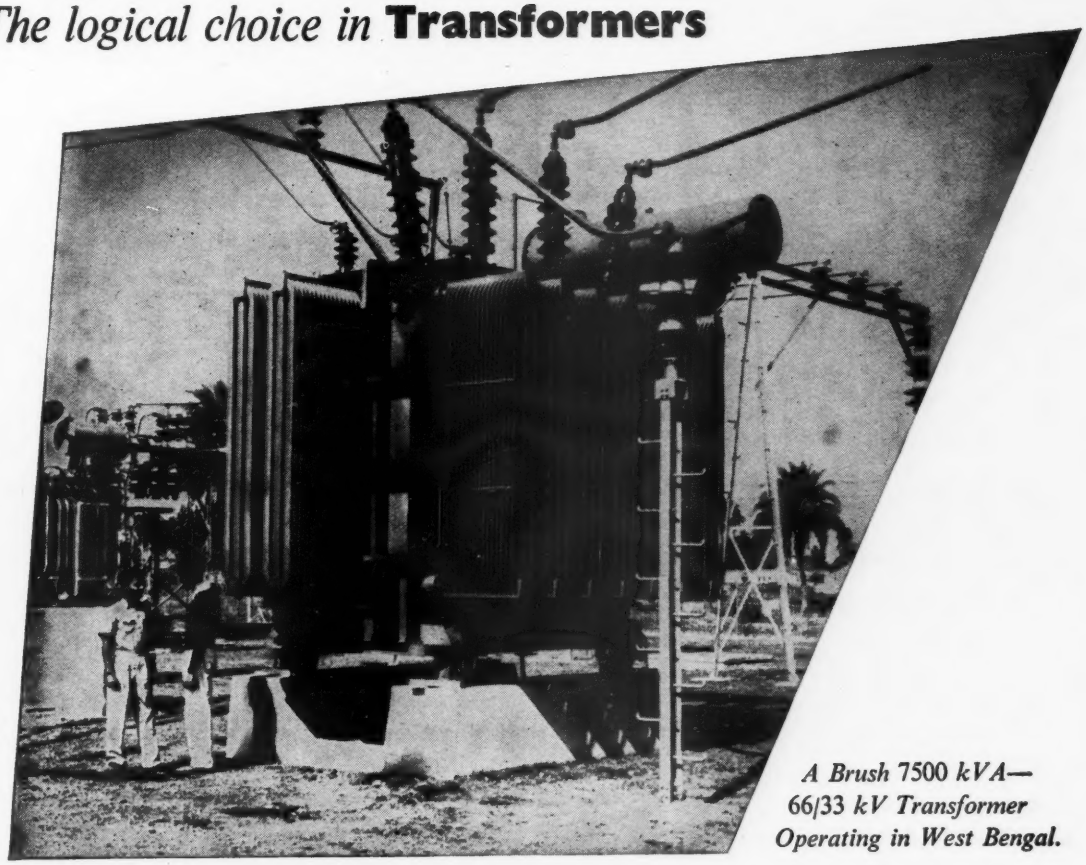

A Brush 7500 kVA—66/33 kV Transformer Operating in West Bengal.

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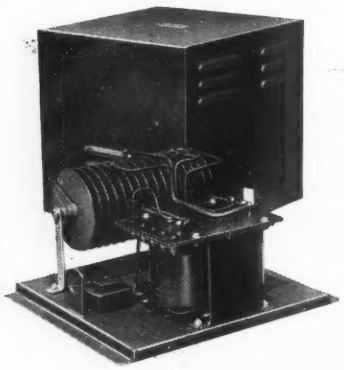

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for all purposes
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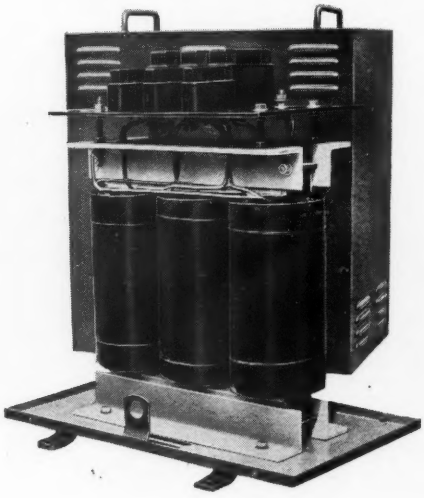

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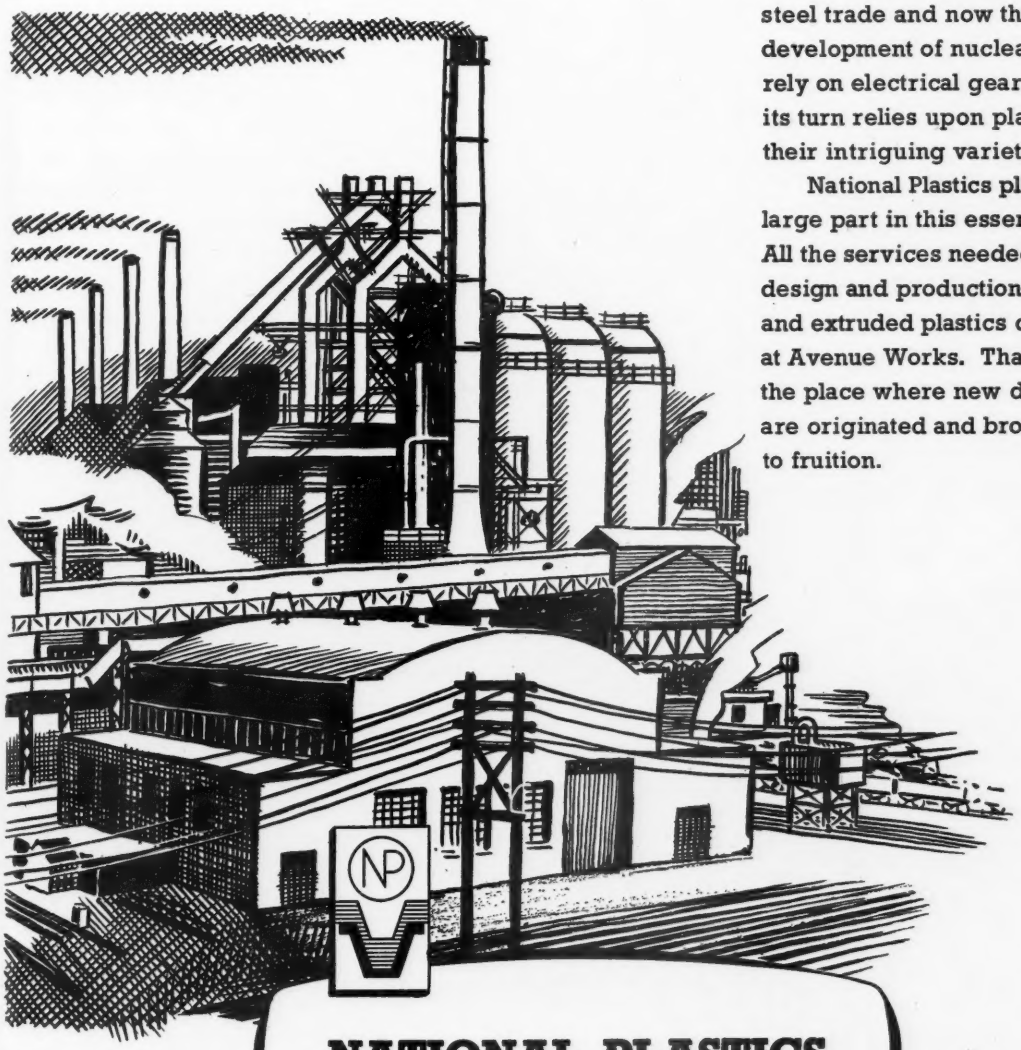

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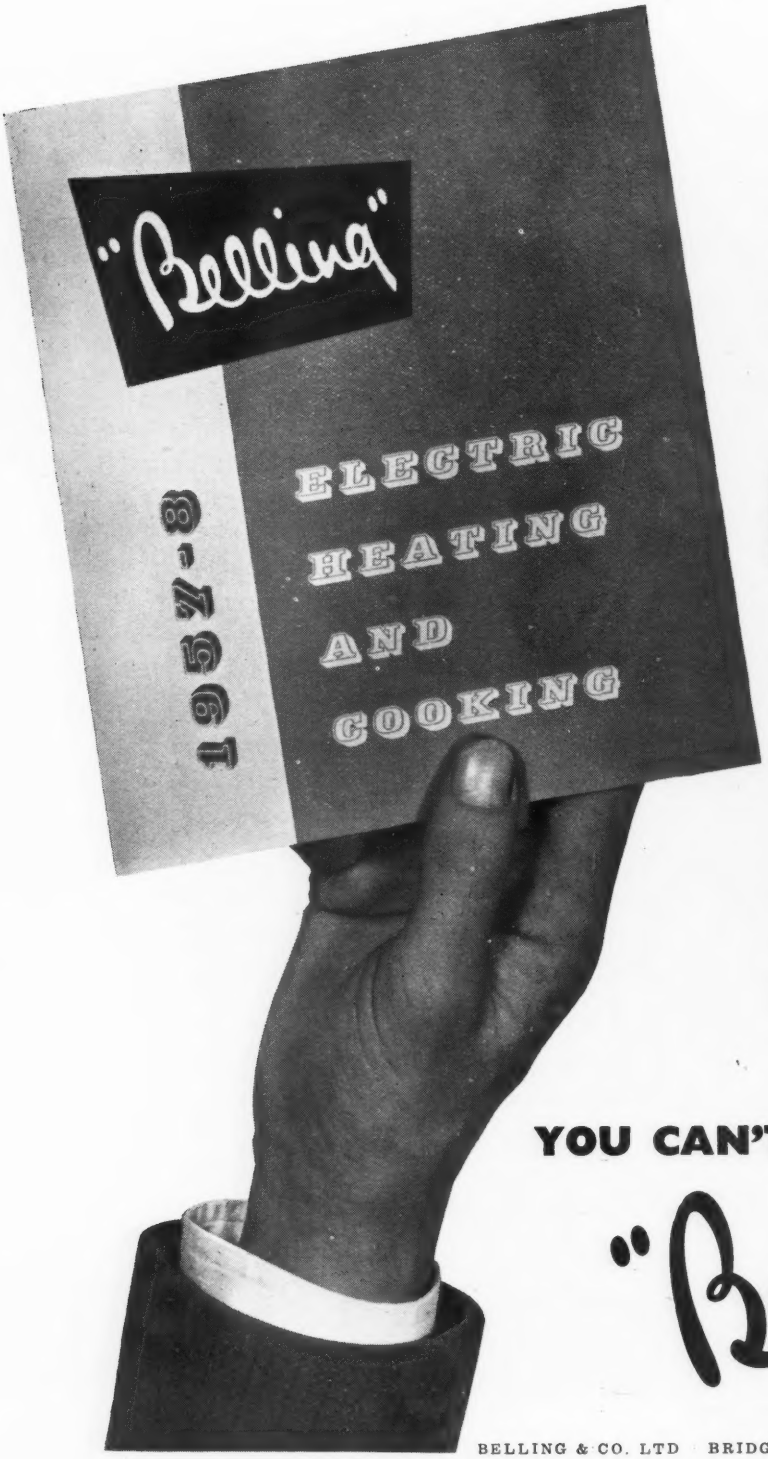

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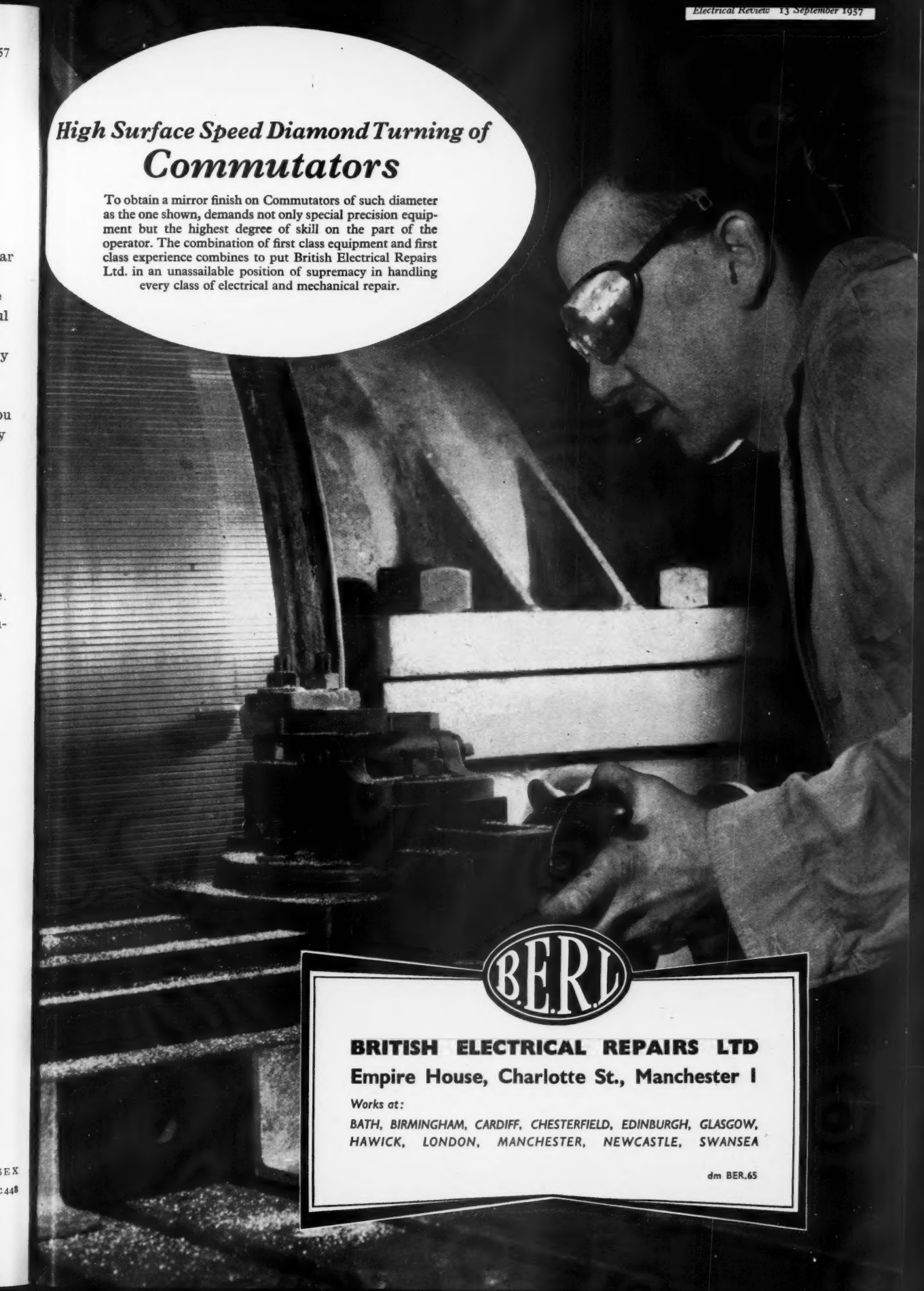

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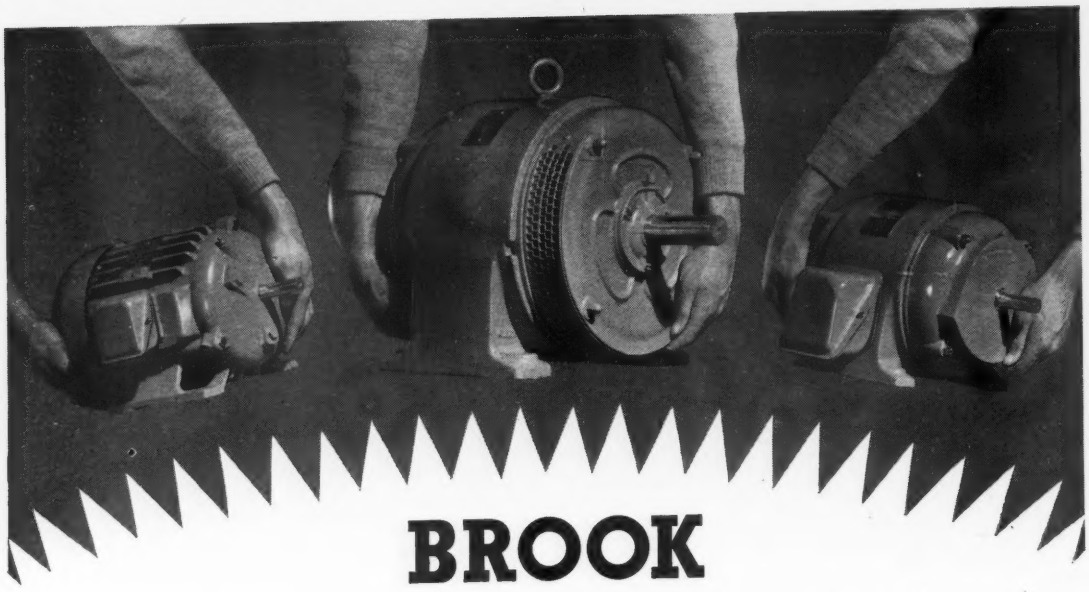

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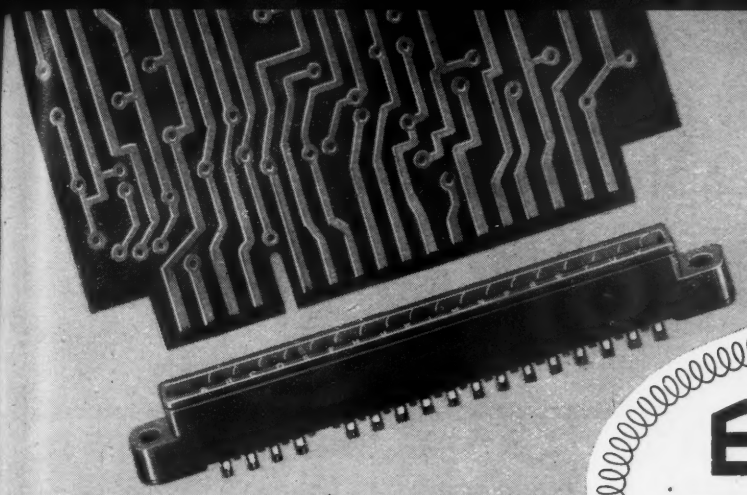

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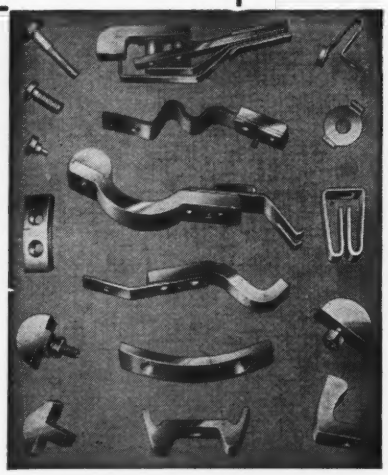

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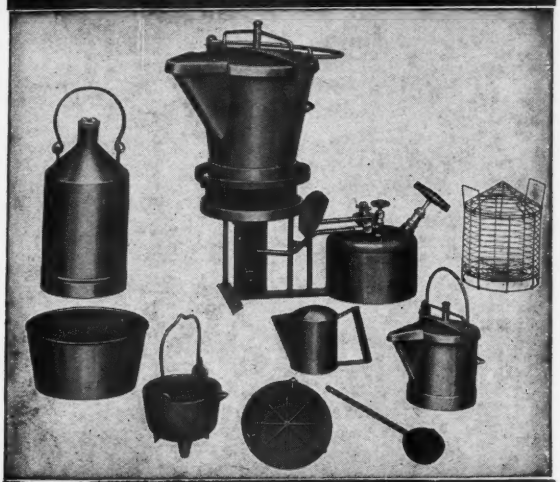

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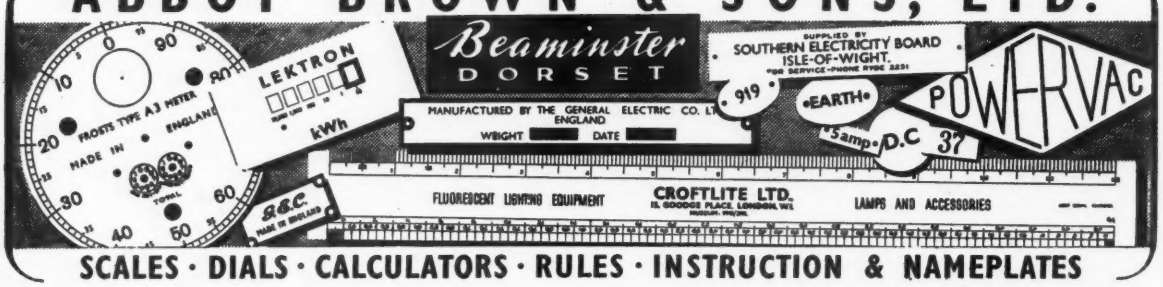

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The '*Golden Ray*' has high optical performance obtained by a specially designed prismatic cutting of the 'Perspex' refractor panel. The low maintenance cost is derived from its extremely practical design and careful choice of materials.

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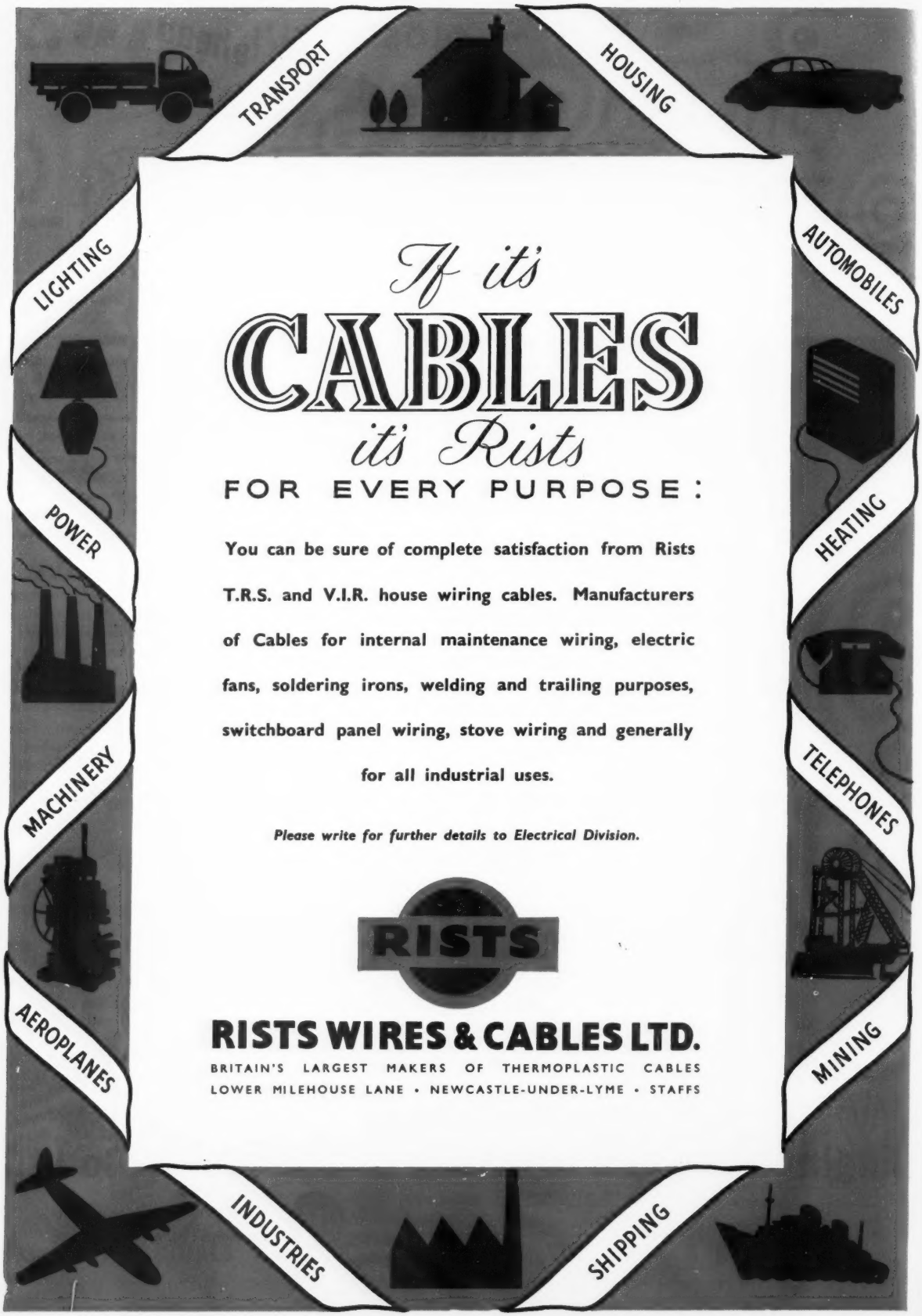

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You can be sure of complete satisfaction from Rists T.R.S. and V.I.R. house wiring cables. Manufacturers of Cables for internal maintenance wiring, electric fans, soldering irons, welding and trailing purposes, switchboard panel wiring, stove wiring and generally for all industrial uses.

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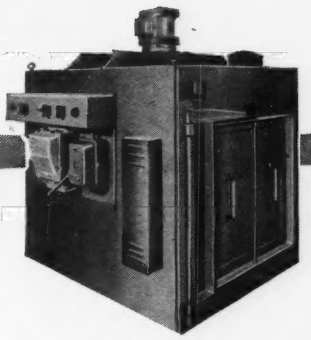

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"Si-Señor! I usa da Wootton Meter Board every time. Da wood is what the Breetish call ze best tested plywood. And they send youse orders pronto — nevair Mañana! Olé!"

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For many years now, since electricity was first used on a large scale, SLATE has been widely used for switchboard panels in many types of installation. Still uniquely suited to this purpose, SLATE is durable, non-conductive, rigid and will not warp. We supply panels to specified dimensions with a tough precision finish, and are also equipped to undertake drilling to particular requirements.

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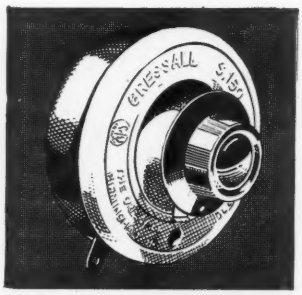
TOROIDALLY WOUND
POTENTIOMETER-RHEOSTATS



Cressall Torostats are a particularly robust form of vitreous enamelled toroidal potentiometer on a ceramic base. This construction gives great mechanical strength and good heat dissipation. Cressall contact brush design ensures perfect contact with negligible wear.

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THE CRESSALL MANUFACTURING COMPANY LIMITED
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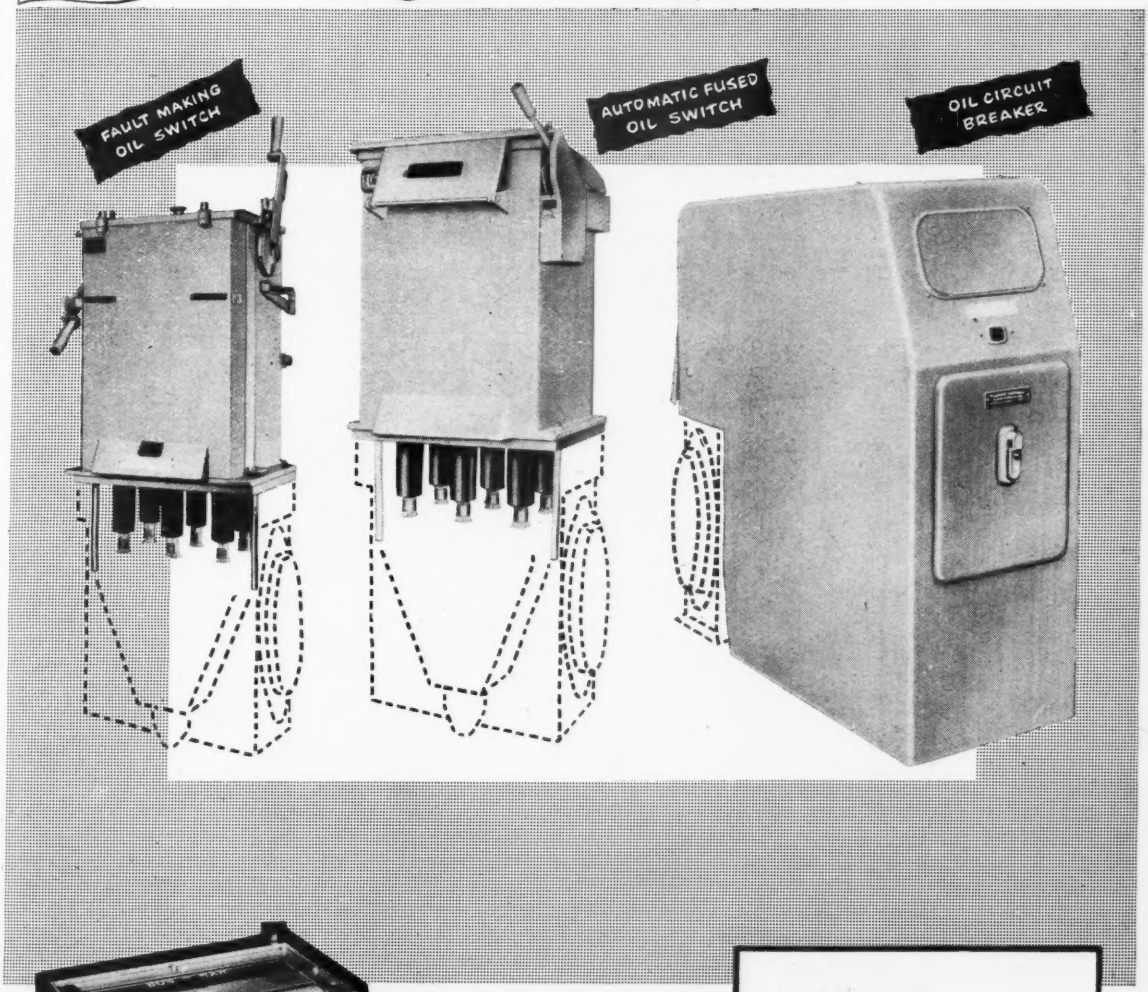
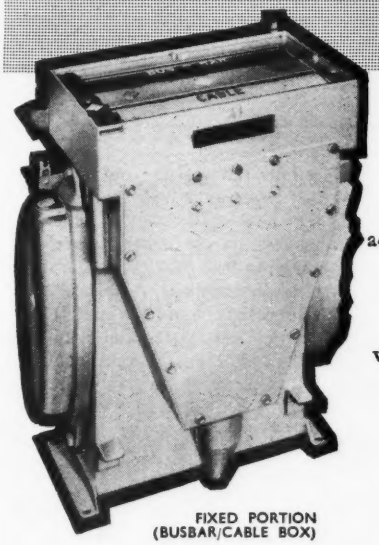
1907 Golden Jubilee 1957

Interchangeable **I.V.I.** *Units . . . . .*





FIXED PORTION (BUSBAR/CABLE BOX)

Important features of Yorkshire Switchgear's IVI principle are adaptability and interchangeability. A range of switching units varying from oil switch to automatic oil circuit breaker can be plugged into a fixed portion which is common to all types, thus providing a unique degree of flexibility and accessibility for maintenance purposes.

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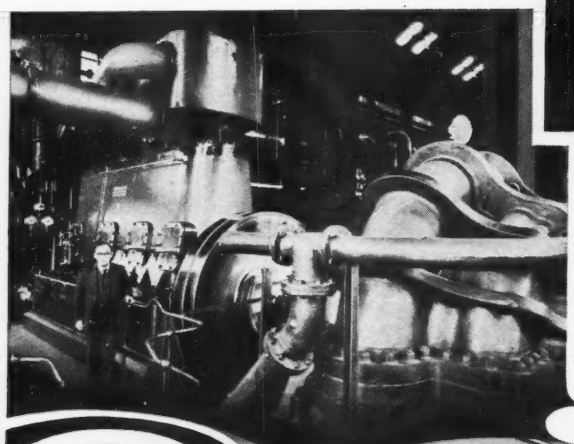
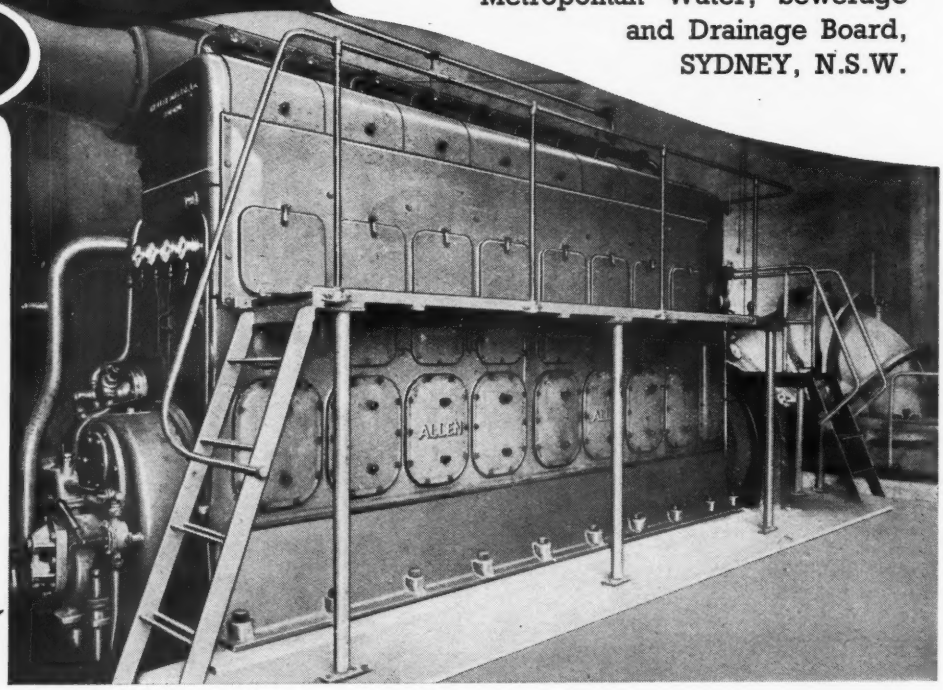
STEAM and DIESEL-powered Pumping Plant

for water supply services of the Metropolitan Water, Sewerage and Drainage Board, SYDNEY, N.S.W.





1904 — **1956**

Illustrated above is an Allen 1,100-b.h.p. triple expansion steam engine driving a 24-in. pump at 275 r.p.m., in the Potts Hill Pumping Station, Sydney. The engine commenced its working life in 1904, driving a generator in the old Melbourne Tramways Board power station. Since its transfer to Sydney in 1923 for pumping service, the unit has run, non-stop, ten months every year, supplying 620,000 gallons of water per hour at 130 feet head, and is still in regular service.

The diesel engine-driven pump also illustrated above, was put into service in 1956, in a new booster station at Regents Park, Sydney, which is linked with the Potts Hill Pumping Station. This unit comprises an 8-cylinder Allen two-stroke engine (built under licence from Harland and Wolff, Ltd.) rated for an output of 796 b.h.p. at site, at a speed of 333 r.p.m., driving through an Allen "Ambiflex" coupling, a Thompson mixed-flow water booster pump. The unit is capable of delivering 3,120,000 gallons per hour at the full-rated speed of 333 r.p.m. against varying heads, and is for operation during periods of hot dry weather in the summer.

Specialists in complete pumping plant installations for Waterworks, Power Stations, Sewage Works, Land Drainage, Docks, Irrigation and industrial applications.

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High input impedance *coupled with rapid response*

The Evershed Quick Response Recorder is servo operated, and works in conjunction with an electronic amplifier. Recorder input is opposed by the feed back voltage from a resetting potentiometer controlled by position of the pen. The error (the voltage difference) drives the pen movement until the feed back voltage balances the input. Maximum sensitivity, with centre zero, plus/minus 4 volts full scale deflection.

The instrument will record sine wave voltages up to 15 cycles per second with amplitude error not exceeding 15% at a peak to peak amplitude of 1½ inches. At smaller amplitudes the frequency response will be higher.

THE EVERSHED QUICK RESPONSE RECORDER

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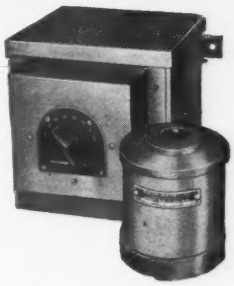
Since its inception in 1932, this Company has concentrated solely on the production of Mercury Switches. It has thereby obtained the widest possible experience and expert knowledge of design, manufacture and application.

THE MERCURY SWITCH MANUFACTURING CO. LTD.
WEST DRAYTON - MIDDX.

MS11

INSTALL 'B-W' WIRE STRIPPING & TINNING BATHS

two operations in one!



This special high temperature pot, seen on left, strips and tins enamelled wire ends at one shot.

The "B-W" range of Solder Pots, typical example seen on right, and Tinning Baths are extensively used by the electrical trades, including special types for PRINTED CIRCUITS.

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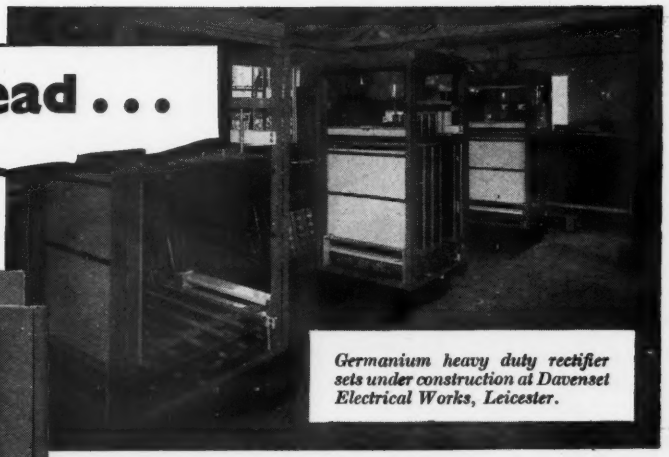

Germanium heavy duty rectifier sets under construction at Davenset Electrical Works, Leicester.

One of a number of germanium rectifier sets recently manufactured in our Leicester works having an output of 7,500 amps 80 volts or 600 kilowatts.

Selenium · Mercury Arc or Hot Cathode Valve

and **NOW!**

RECTIFIER SETS

with

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junction rectifier cells

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30 AMP
DOUBLE POLE
A.C. SWITCH

For WATER HEATERS and any 15-30 amp purpose requiring good capacity margin

All-insulated.
Brown or cream Bakelite.
For surface or sunk wiring.
Easy to instal.

With or without neon pilot light.
With or without flashbox.
Competitively priced.

The words "Water Heater" can be engraved if desired.

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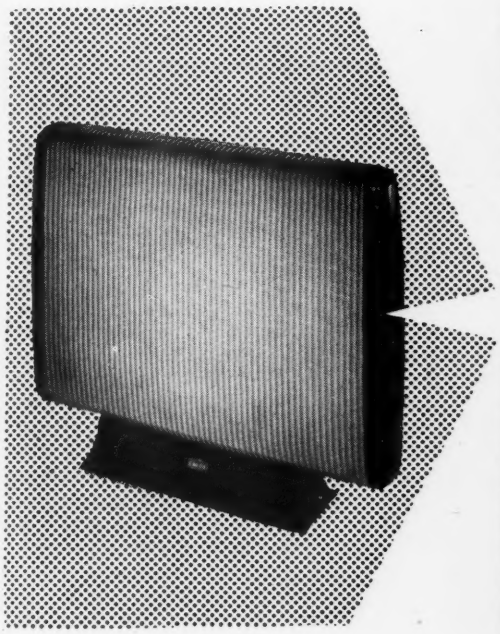
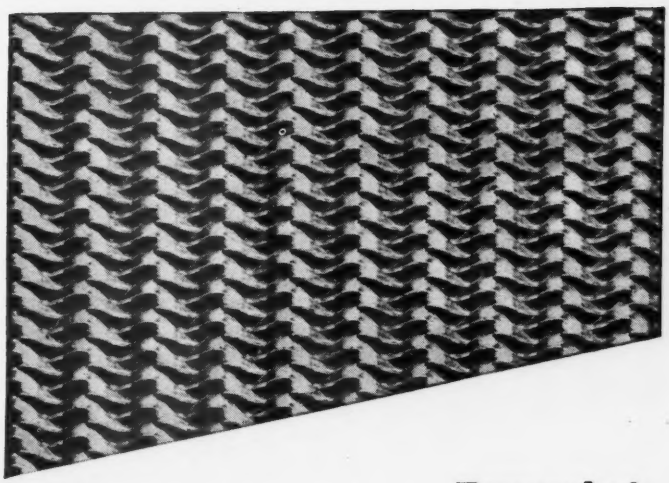
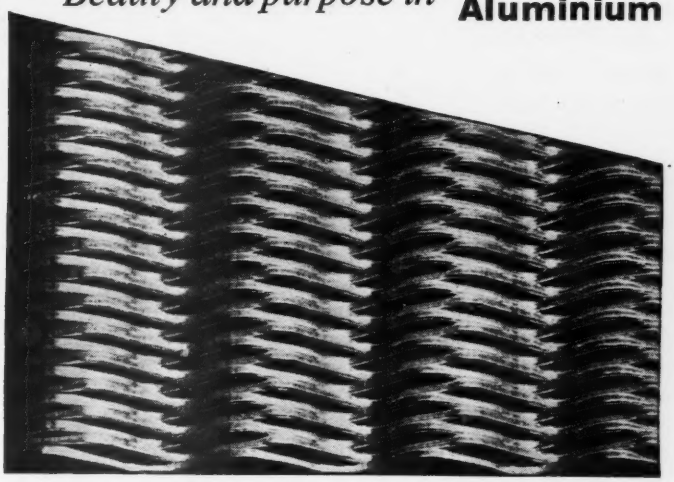
CONTACTUM LTD., VICTORIA WORKS, CRICKLEWOOD, LONDON, N.W.2. (Gladstone 6366/7)

Creda Capri heater by Simplex Electric Co. Ltd.





Beauty and purpose in **Expanded Aluminium**



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- Attractive surface sparkle and texture, especially when colour-anodised.
- Supplied in a range of shapes and sizes of mesh unique in metal fabrics.
- Widely used in electrical, radio, furniture, vehicle, aircraft and many engineering industries, as well as in display.

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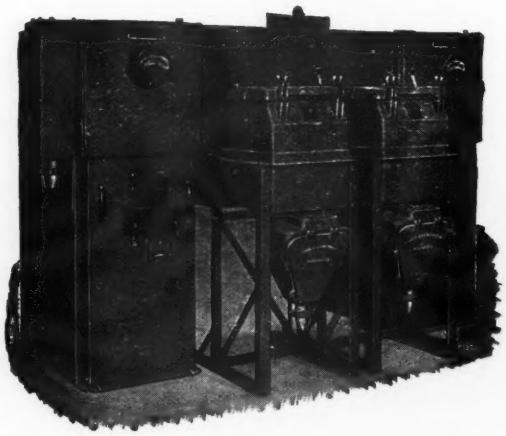
L&C

SWITCHGEAR

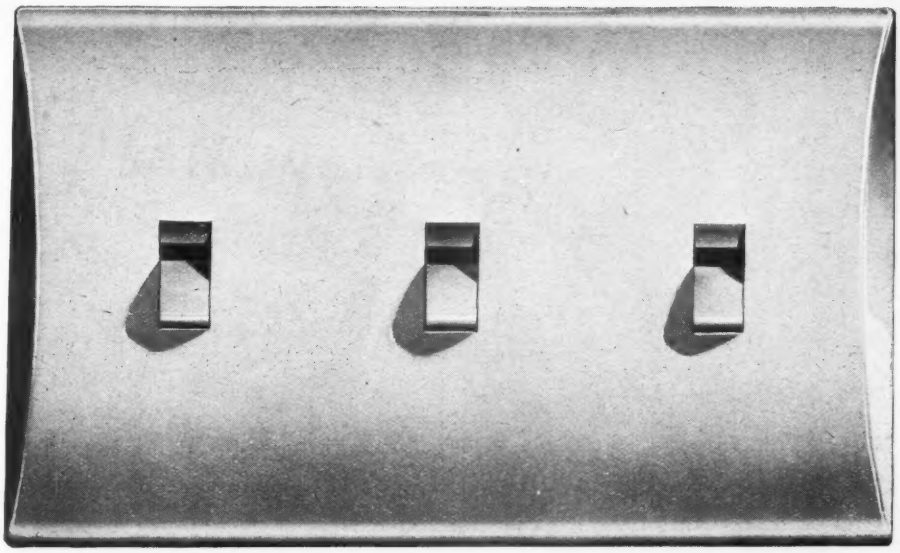
Two air insulated circuit breaker units and two oil fuse circuit breakers built into one board. Further extension with either type of unit.



The oil fuse circuit breaker is part of a versatile range of economical outdoor switchgear for 11kV service.

LONG & CRAWFORD LTD.

GORTON ROAD - MANCHESTER 12

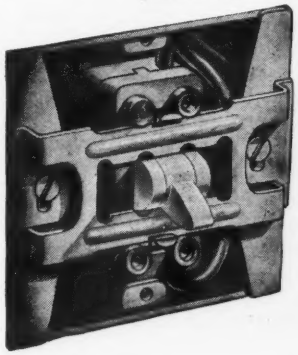


FALKS new switch makes others obsolete

Here is a handsome new switch, modern in every respect and unique being without plate fixing screws.

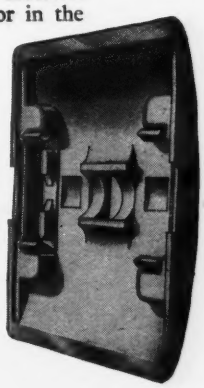
The design must appeal to every architect and its simplicity to the contractor in the saving of fixing time.

Note these special features—



The 'Snapfast' switch unit is fitted to the standard box by two screws. It is very readily wired and the box provides ample space for cable slack. Provision is also made within the switch assembly to correct "out of square" boxes.

The secret of the FALKS 'Snapfast' lies in the Spring steel inserts which register with the unit frame and securely hold the cover.



It is now the simplest of operations to snap the cover into position. Although firmly fixed it can be prised off and replaced without damage to switch or surroundings.

'SNAPFAST' SWITCH BY FALKS

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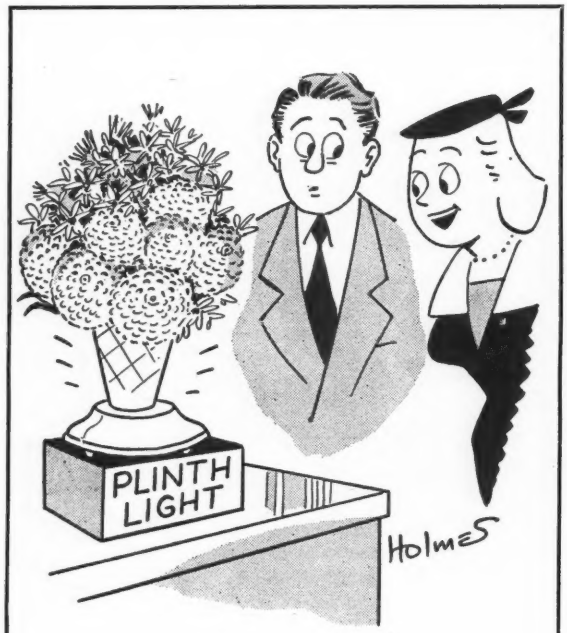

"Oh! Aren't they lovely!
I'll have a bunch of those."

This cartoon is reproduced by courtesy of "Electrical & Radio Trading."

But—joking apart—R.E.A.L. Plinths are steady sellers all the year round.

We are glad to announce that there will be no increase in prices this season.

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36/9 each inc. P.T.

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List No. 5002
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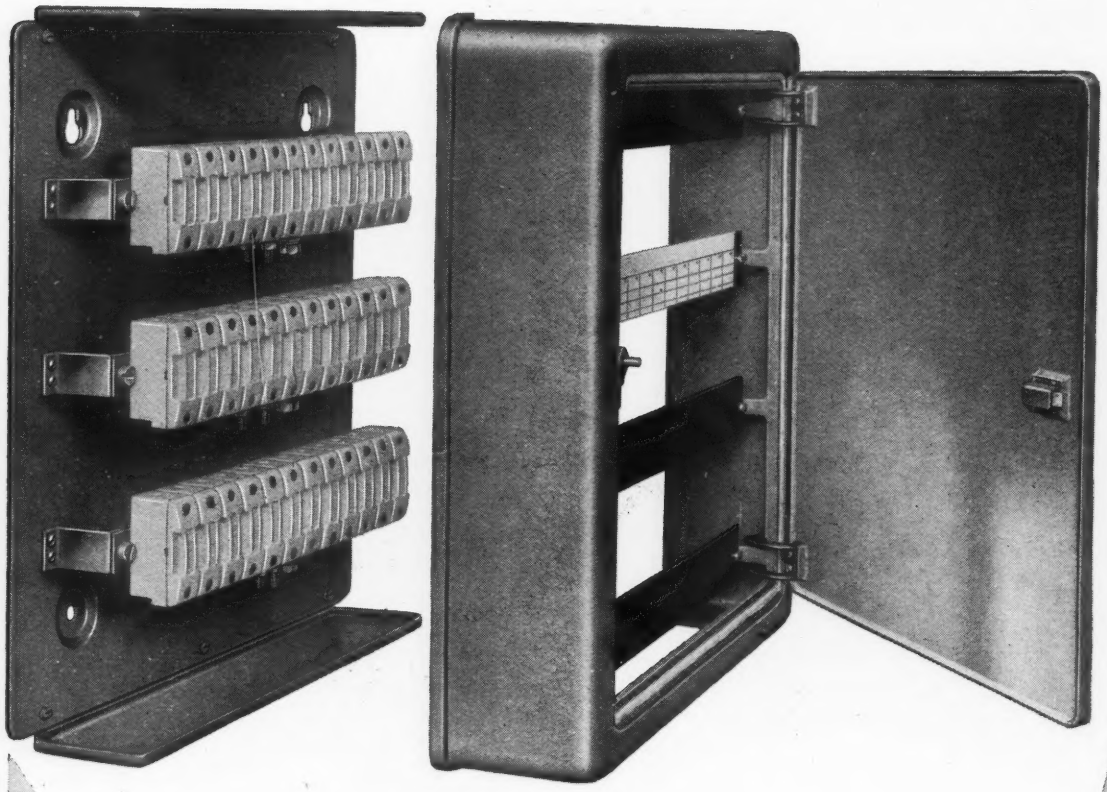

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(*Continued from previous page*)

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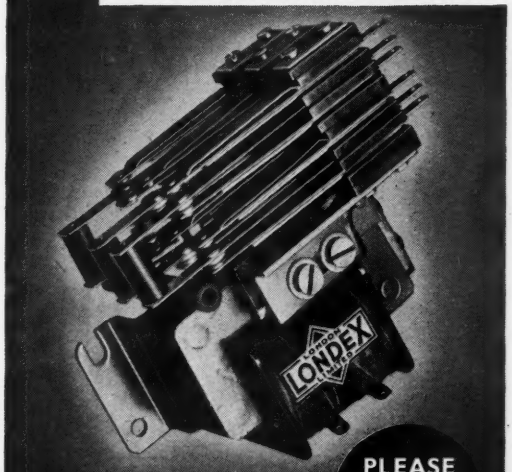

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One Rotary Regavolt* controls any A.C. load from zero to 270v

Designers no longer need special designs (or sets of adjustable resistances) to hold voltages steady. They can rely on Berco Rotary Regavolts for precise voltage regulation, especially where heavy currents are involved. That's why Regavolts are specified for industrial control . . . and for fine control on precision instruments too. Study the features below, and you'll agree the Rotary Regavolt **proves** *Berco know* **how***!*

**** Ask for Lists 615A and 615B with full details of Regavolt range. Delivery from stock or in a matter of days.***

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9 Can be fitted with motor drive.

Berco have specialised in voltage and current control for 30 years. . .

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Flying Repairs. Repairs from overseas are not infrequent at the house of Collins. The above photograph shows two rotors, which had just arrived by air from the Middle East, being unpacked. A few days later they were again in B.O.A.C.'s charge on their urgent way back to another satisfied customer.

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Central London Works

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taping machines

Tape stator and armature coils quickly and neatly. Other applications are the taping of bus bars, wiring harnesses, etc.
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Full details on request.

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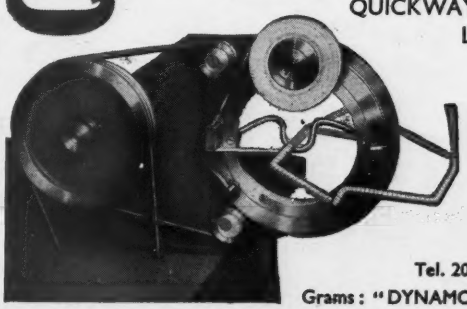

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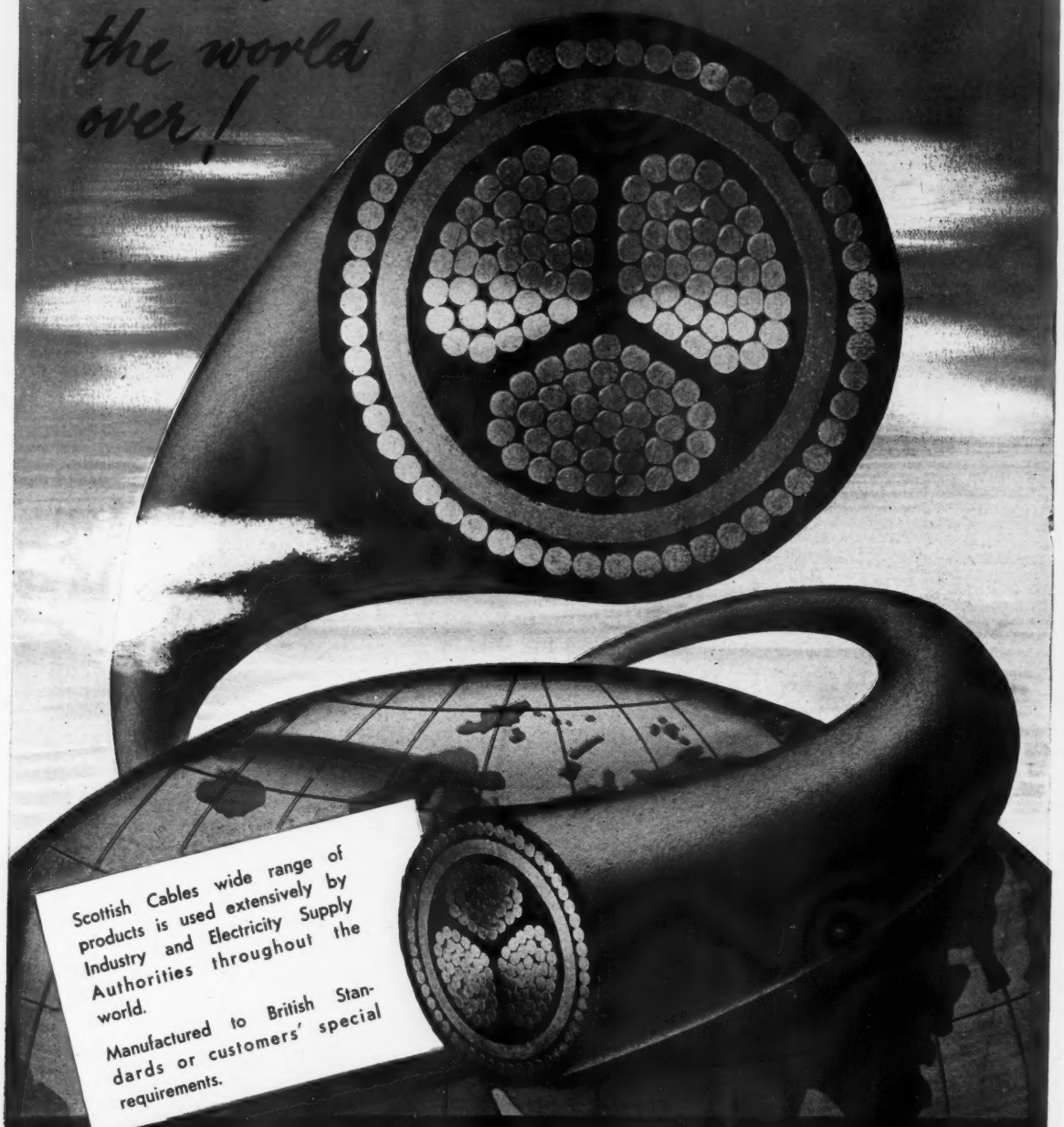
SCOTTISH CABLES

in use the world over!



Scottish Cables wide range of products is used extensively by Industry and Electricity Supply Authorities throughout the world.

Manufactured to British Standards or customers' special requirements.

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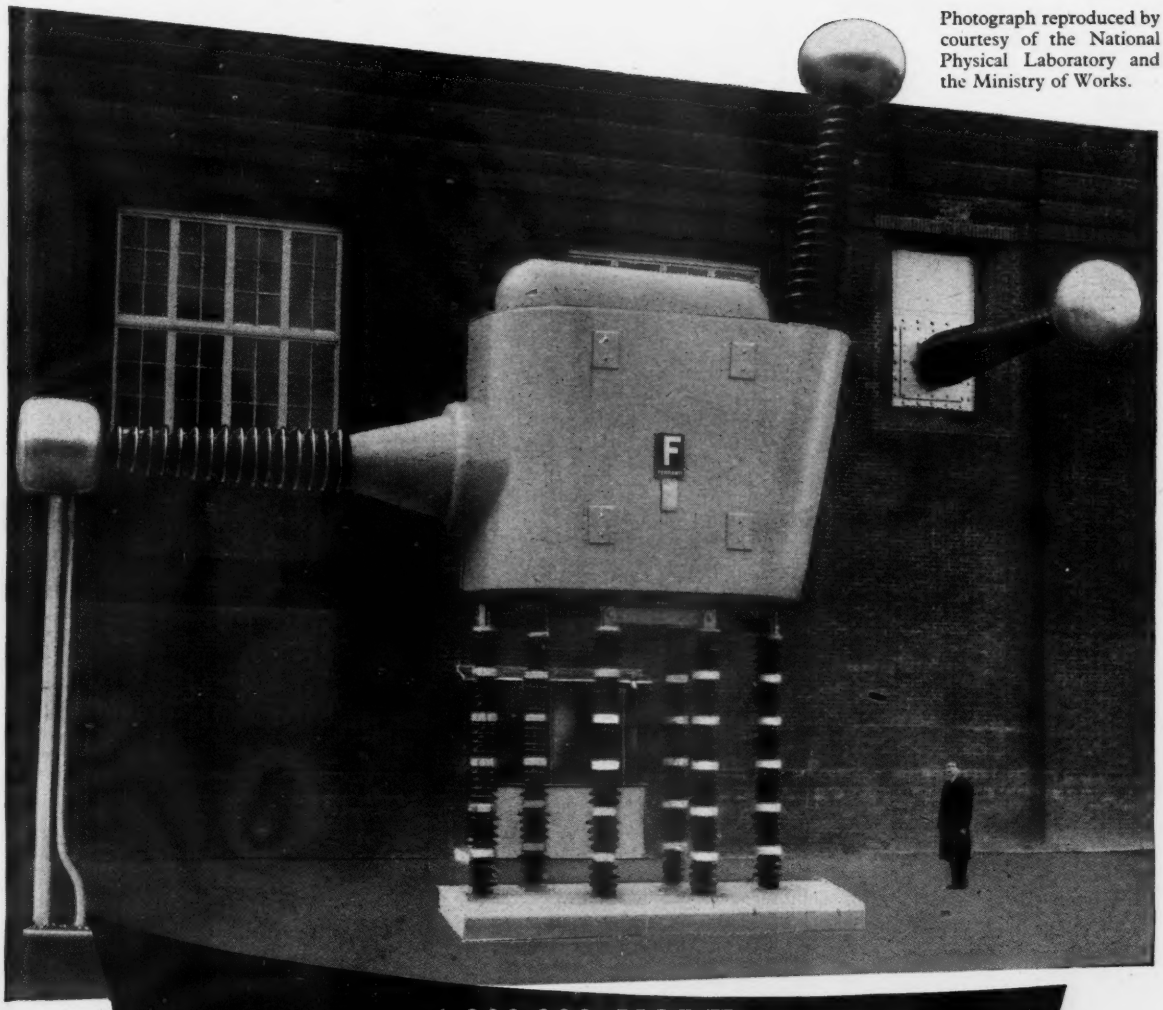
LONDON OFFICE • BUSH HOUSE • ALDWYCH, W.C.2

Associated Company: SCOTTISH CABLES (SOUTH AFRICA) LTD. PIETERMARITZBURG, NATAL



Photograph reproduced by courtesy of the National Physical Laboratory and the Ministry of Works.

1,000,000 VOLT FERRANTI TESTING TRANSFORMER *installed at the* NATIONAL PHYSICAL LABORATORY

THE HIGHEST VOLTAGE OUTDOOR TESTING TRANSFORMER IN THE UNITED KINGDOM

A 1,000,000 Volt Ferranti Testing Transformer operating with the tank at a potential of 500,000 Volts above earth. The transformer is mounted on 6 columns of insulators at a height of 12 feet from ground level. The overall height of the complete equipment is 36 feet. Associated with the equipment is a 1,000,000 Volt wall bushing, 36 feet in length, through which the supply is carried to the test laboratories.

Ferranti are specialists in the manufacture of High Voltage A.C., D.C. and Impulse Testing Equipments for all kinds of research and routine testing and are backed by over 70 years' experience in the manufacture and development of electrical apparatus.

This equipment was installed under the direction of the Ministry of Works.

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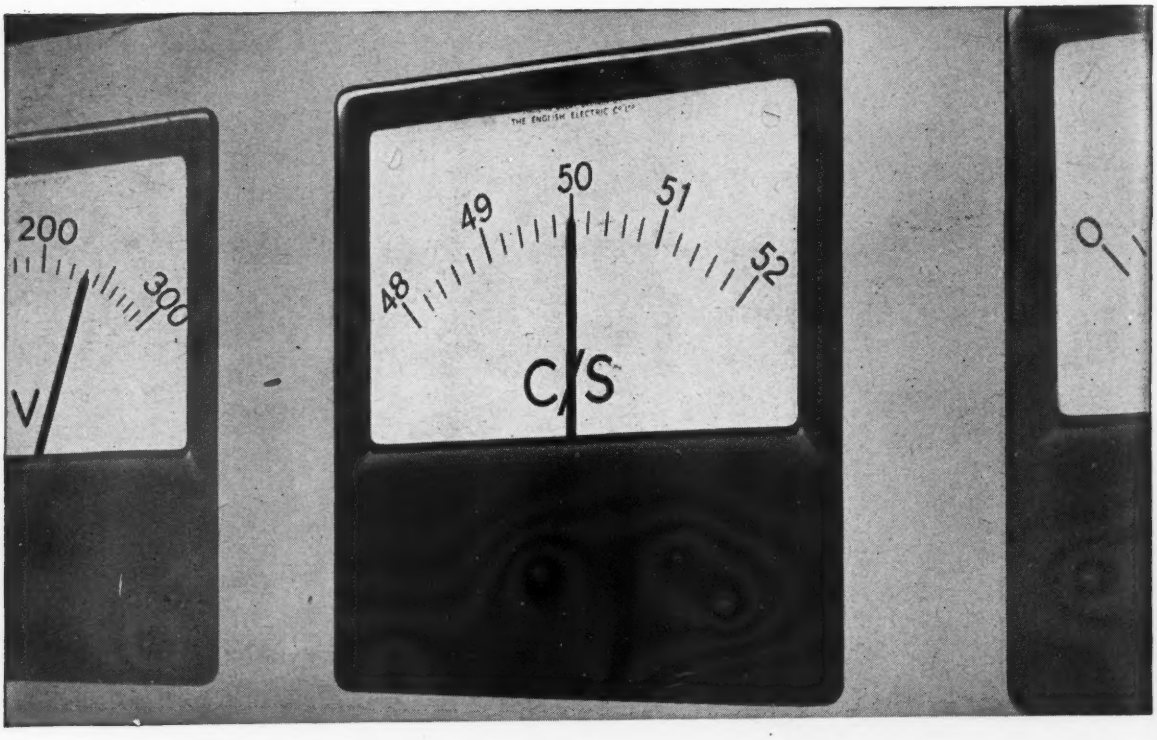
Not disturbed by normal voltage fluctuations



THE NEW 'ENGLISH ELECTRIC' FREQUENCY INDICATOR has been developed especially to maintain a stable and accurate reading even at times of normal voltage fluctuations and despite the presence of harmonics in the supply voltage waveform. The extraordinary accuracy of these instruments ensures negligible error at nominal supply voltage and an average error of less than .03% at the nominal supply voltage ±10%

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indicating instruments

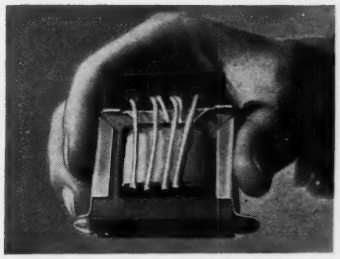
THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2

Meter, Relay and Instrument Division, Stafford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

INS 3717

from megawatts to milliamps



There's a 'SCOTCH BOY' tape for every tape need in electrical engineering. Tapes for wrapping bus-bars. Tapes that speed the manufacture of coils and transformers for radio and television sets. Tapes of treated paper, tapes of acetate film and acetate cloth, of glass cloth, polyester film, and p.v.c. Many of these tapes are available with thermosetting adhesive. The range of 'SCOTCH BOY' electrical tapes is comprehensive — and every 'SCOTCH BOY' tape is the best of its kind in the world.

DON'T ACCEPT THESE CLAIMS WITHOUT PROOF

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All products are machined from bar materials.

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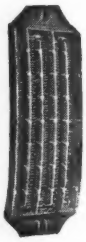
HOT NEWS ON ELEMENTS!

TO WARM THE HEART OF EVERY RETAILER AND WHOLESALER!



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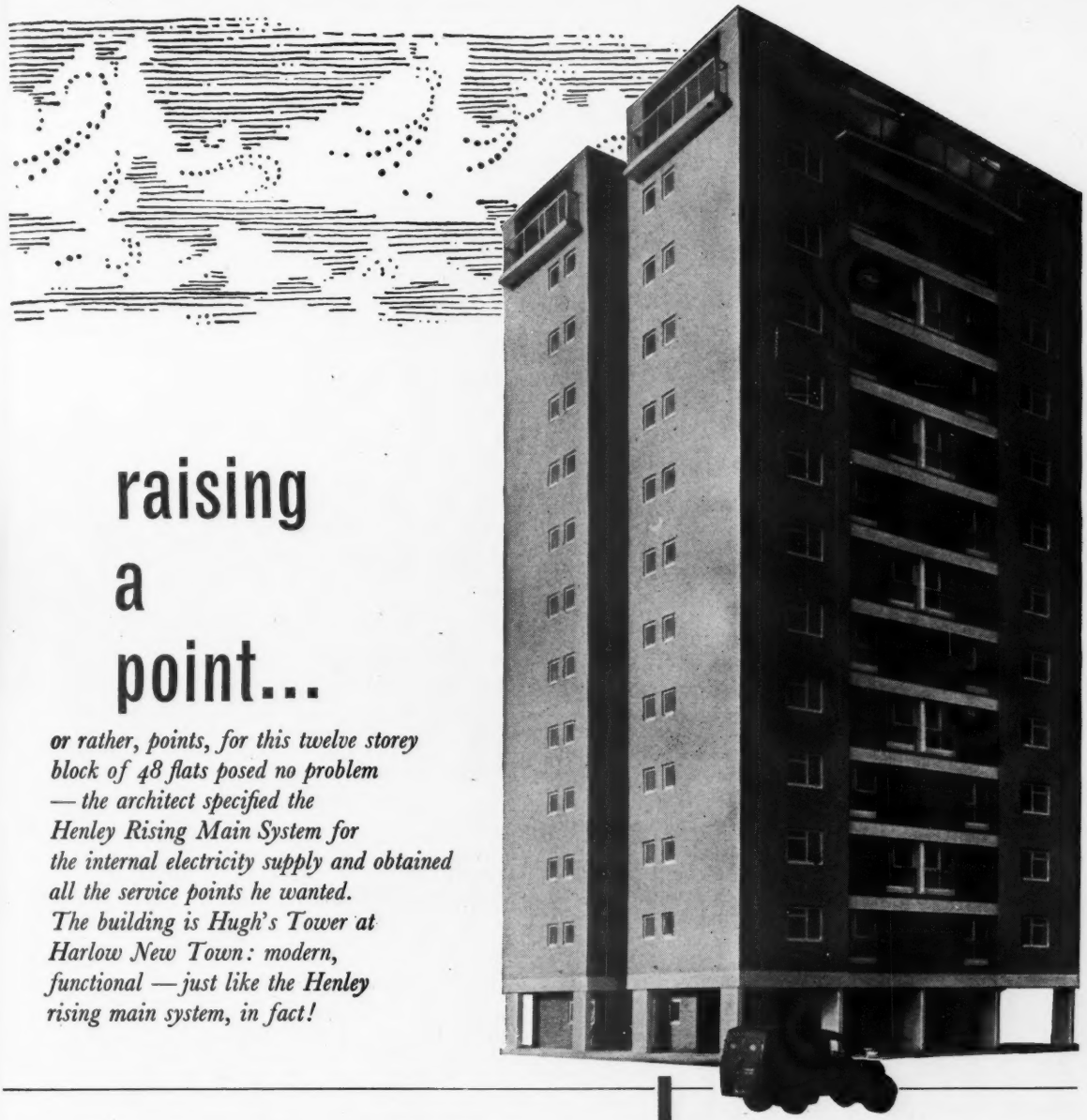
IF YOU WOULD ALSO LIKE A COPY OF OUR NEW APPLIANCES CATALOGUE ASK FOR CAT. No. DAR/8ER IN ADDITION

WRITE TO: **METWAY — KEMP TOWN — BRIGHTON**



raising a point...

or rather, points, for this twelve storey block of 48 flats posed no problem — the architect specified the Henley Rising Main System for the internal electricity supply and obtained all the service points he wanted. The building is Hugh's Tower at Harlow New Town: modern, functional — just like the Henley rising main system, in fact!

The Henley rising main system is specially designed for modern multi-storey buildings. It can be accommodated in a 13½" x 4½" chase. The cost is attractive, the equipment robust, adaptable, and easily installed—a real Henley job.
May we send you our Catalogue 46? It will give you all the details, with explanatory diagrams.

Harlow Development Corporation
Architect Planner: Frederick Gibberd, C.B.E. F.R.I.B.A. M.P.T.I.
Executive Architect: V. Hamnett, B.SC. A.R.I.B.A. A.M.T.P.I. A.R.I.C.S.
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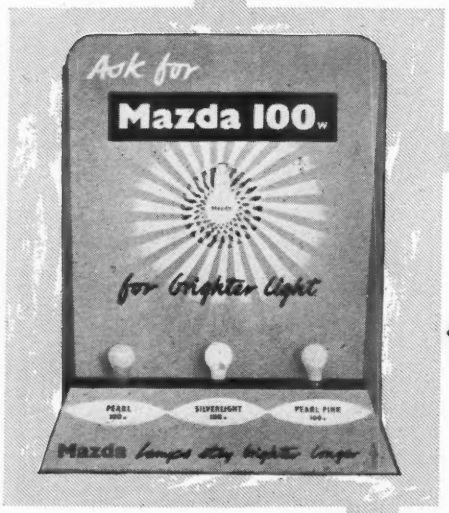
the HENLEY rising main system

W. T. HENLEY'S TELEGRAPH WORKS COMPANY LIMITED · 51-53 HATTON GARDEN · LONDON · E.C.1

Mazda stockists will have

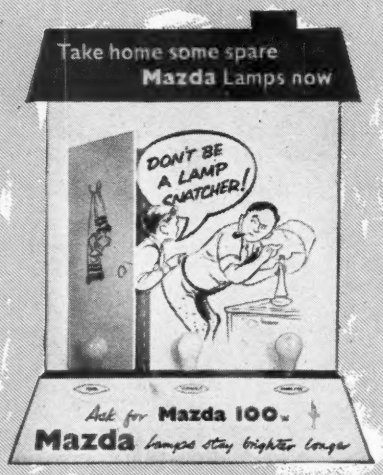


Your windows will be eye-catchers with Mazda display material ! Gay and colourful showcards and pelmets are freely available or you can take advantage of our complete free window-dressing service.

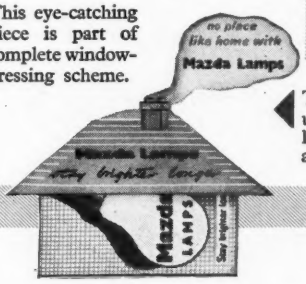
◀ Animated "hypnotic circle" centre-piece, operated by long-life batteries. Orange and black. Sells 100-watt Mazda lamp and displays Pearl, Pearl-pink and Silverlight. Part of complete window-dressing only.

A compact merchandising unit that will help you sell more lamps. Strong and durable, it holds a gross of Mazda lamps, and stands solus or fits the front of your counter — ask your Mazda or wholesaler's representative. ▼

▲ The famous Mazda shelf girl. Part of complete window-dressing, but ask for it separately if you like.



▲ This eye-catching piece is part of complete window-dressing scheme.

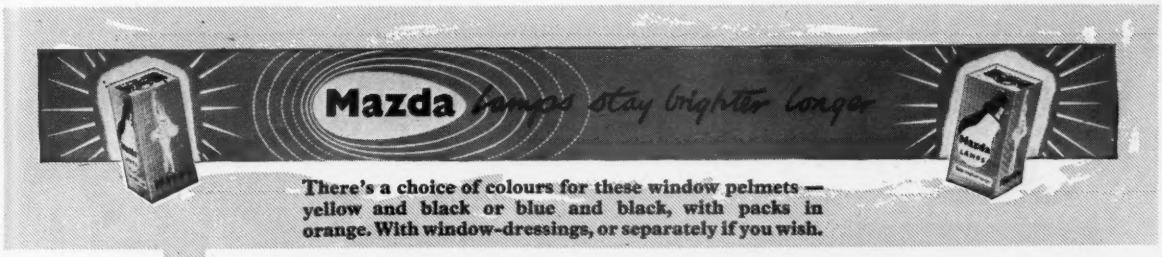


◀ These roof crowners enable you to build up delightfully attractive 'villages' from lamp packs. Slogan on each. Freely available on request.

◀ The sort of showcards no one can resist ! Freely available through representatives.

Mazda

the gayest windows of all !



There's a choice of colours for these window pelmets — yellow and black or blue and black, with packs in orange. With window-dressings, or separately if you wish.

Window and counter show-card showing three previous Queens of Light being crowned. Window-dressings only, or local dressings arranged with your Mazda representative.

The popular Mazda 'Queen of Light' will reign again this winter!

Once again Mazda is holding its annual competition to find Britain's " Queen of Light ". Display pieces give details of this famous nation wide competition, with over £1,000 in cash prizes for your blonde customers.

Freely available poster in a choice of two sizes.

Queen of Light centre-piece and entry form dispenser combined. Window-dressings only.

lamps stay brighter longer

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(An A.E.I. Company)
Publicity Department
18 Bedford Square, London, W.C.1

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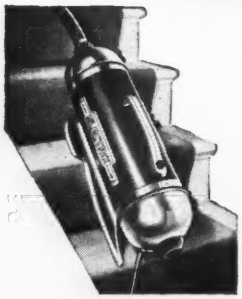


'UP THE STAIR'
VACUUM CLEANER

Silent and smooth running, follows the housewife upstairs. Attachments for every job.

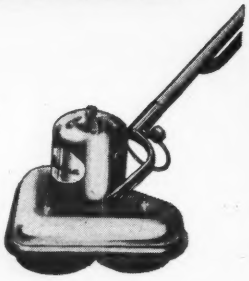
RETAIL PRICE **£27.16.0** (inc. P.T.)

Electrix

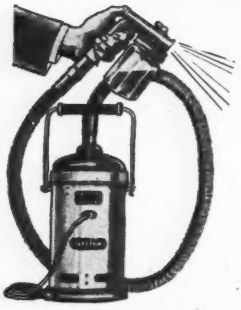
FLOOR POLISHER

Polisher and Scrubber suitable for wood, tiles and lino. Lambswool polishing pads included.

RETAIL PRICE **£22.18.0** (inc. P.T.)



products



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Portable Sprayer Unit with 101 uses. Enables the householder to do many jobs — quicker, easier and for far less cost.
The original and the best.

RETAIL PRICE **£9.7.0** (no tax)

your business!

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Announcing HURSEAL'S Big Prize

WINDOW DISPLAY COMPETITION

FIRST PRIZE £150
SECOND £75
THIRD £50
RADIATORS FOR WINNER AND RUNNERS-UP

All Hurseal stockists are invited to compete in this exciting new National Window Display Competition, opening on October 15th.

The winner holds for a year the Hurseal Silver Challenge Cup and receives a cash prize of £150.

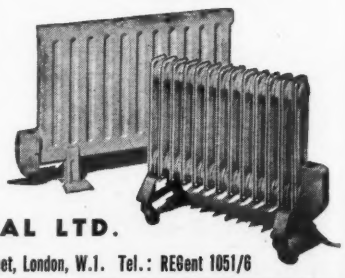
Second prize is £75, Third prize £50. In addition new Hurseal TV½ oil-filled electric panel radiators go to the winners and, as Merit Awards, to the ten runners-up.

WHAT TO DO: Displays should be installed by October 15th, and left on view until *November 15th.*

The theme of the display should be "for warmth and comfort 'By Hurseal'" and may embody any of the Hurseal range of products — Towel Rails, Electric Bed Sheets, 'Stick-a-seal' and other products of Sealdraught Ltd. — but the central feature must be Hurseal oil-filled electric radiators. Only Hurseal and Sealdraught products may appear in the display.

The displays should be photographed and a print of about postcard size sent to: Window Display Competition, Hurseal Ltd., 229 Regent Street, London, W.1, arriving not later than October 29th, 1957. Entries should bear the name and address of the firm and the window-dresser.

The displays will be judged by a selected panel from the Hurseal Group and their Advertising Agents, whose decision will be final.



THE SEAL OF SAFETY Hurseal

HURSEAL LTD.
229 Regent Street, London, W.1. Tel.: REGent 1051/6

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NEW METHOD OF PACKING

★ADDED PROTECTION

★NON-RETURNABLE TRAY

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Each reel is wrapped with a piece of cardboard shaped to fit round the periphery of the flanges and is held in place by a rubber band. This cardboard 'tube' gives complete protection to the wire. The reels are supplied in a non-returnable cardboard tray for which no charge is made.

THE LONDON ELECTRIC WIRE COMPANY & SMITHS LIMITED

LEYTON · LONDON · E.10

IN CONDITIONS LIKE THESE...

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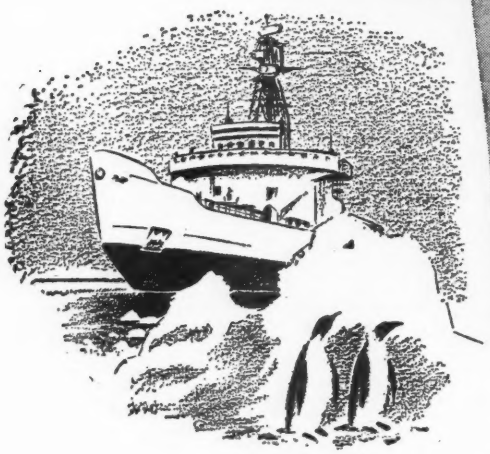

THE LIFE OF ROTATING ELECTRICAL MACHINERY DEPENDS ON THE QUALITY OF THE INSULATING VARNISH

All grades of Sterling electrical insulating varnishes are individually blended to suit the varying conditions under which motors operate in many different parts of the world where so much depends on the varnish. Sterling chemists have to consider — and combat — such diverse factors as extremely high or low temperatures, tropical service, presence of abrasives, alkalis, acids, etc.

Write for details — we shall be pleased to advise you without obligation.

MADE BY CHEMISTS

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INSULATING VARNISHES

SERVICED BY ENGINEERS

SPECIALISTS IN INSULATION

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Telephone: TRAfford Park 0282 (4 lines) *Telegrams: "DIELECTRIC MANCHESTER"*

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We'll be at

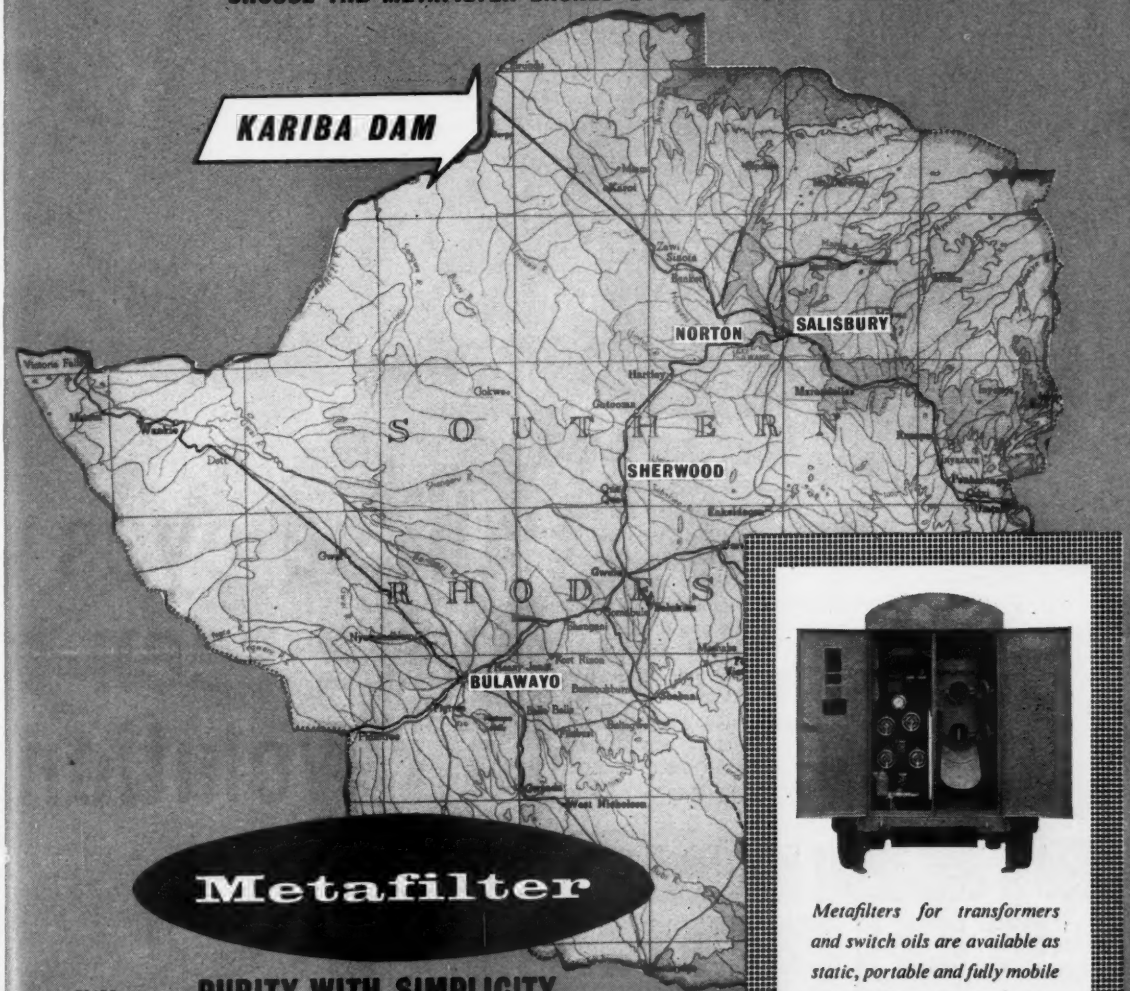
KARIBA!

For the great Hydro-electric project at Kariba Gorge the METAFILTRATION CO. LTD., in association with The British Thomson-Houston Export Co Ltd., will be supplying Permanent *cold* purification, storage and pumping equipment for insulating oil used in the 330 kV. B.T.H oil circuit breakers, also the transformers, and reactors at each of the stations shown on the map.

METAFILTRATION will include in their supply:—
500 gallons/hour METAFILTERS
10,000 gallon oil storage tanks
13,000 gallons/hour transfer pumps
More than 3 *miles* of 2", 3" and 4" pipework!

The acceptance of the Metafilter *cold* filtration system for this great project is yet another fine tribute to the efficiency of our installations

CHOOSE THE METAFILTER BACKED BY 29 YEARS EXPERIENCE.



Metafilters for transformers and switch oils are available as static, portable and fully mobile units with capacities from 50 g.p.h. to 1000 g.p.h.

Metafilter

PURITY WITH SIMPLICITY

TRADE MARK

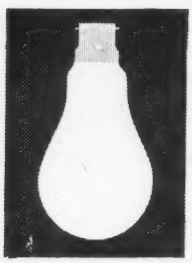
THE METAFILTRATION CO. LTD., BELGRAVE RD., HOUNSLOW, MIDDX.
Telephone HOUnslow 1121-3

One? Bless your heart, Granny has seen a dozen: the filament lamp, the telephone, the 'Talkies', the 'Telly', and most of them sprang from the inventions of three men: Siemens, Edison and Swan. Edison and Swan invented the filament lamp which added so many hours to her day, and the Ediswan factories helped to carry it on to its present state of perfection. They also produced the first radio valves and the first TV tubes of the type fitted to most British sets to-day. These factories are now an important part of the new Siemens Edison Swan company where further revolutions are already beginning to take shape.

these eyes have seen a revolution

SIEMENS EDISON SWAN

Siemens Edison Swan Ltd. An A.E.I. Company



say SIEMENS EDISWAN *for a brighter light*

LAMPS • TELEVISION TUBES • RADIO VALVES

old lamps sell new

Our idea in giving your customers this bit of lamp history can be explained in seven words: to help you sell Siemens Ediswan lamps. And there is no doubt about it, whatever you are selling, it *is* a help when you can offer a product branded with names that go right back to the original invention. You know you are doing just that when you sell Siemens Ediswan lamps, and we are seeing to it that your customers know it too.

ANOTHER ADVERTISEMENT IN THE DRAMATIC SERIES THAT IS APPEARING REGULARLY IN THE DAILY EXPRESS, DAILY MAIL, DAILY MIRROR AND LEADING PROVINCIAL NEWSPAPERS.
They are telling your customers that when they see our name on electrical goods they can trust both the products and the people who sell them.

SIEMENS EDISON SWAN LIMITED · AN A.E.I. COMPANY

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District Offices and Branches throughout the country

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BICC PRESSED COPPER SERVICE BOXES

- Light in weight
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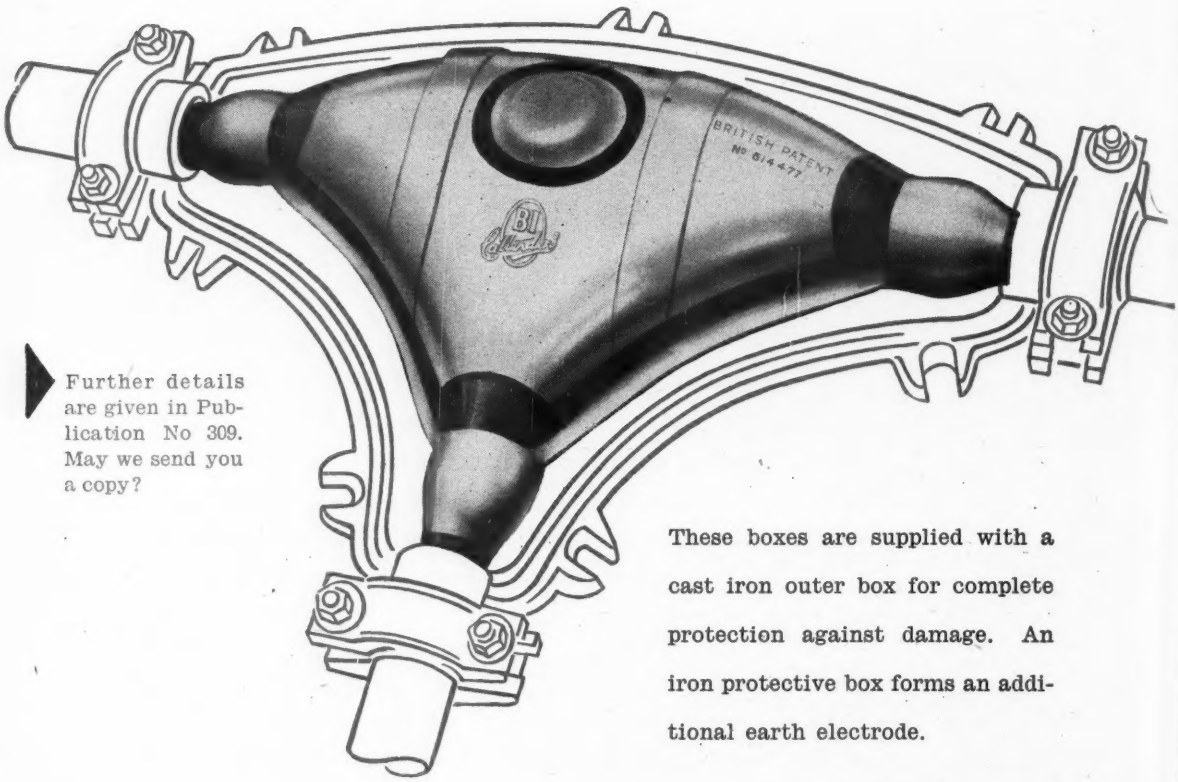
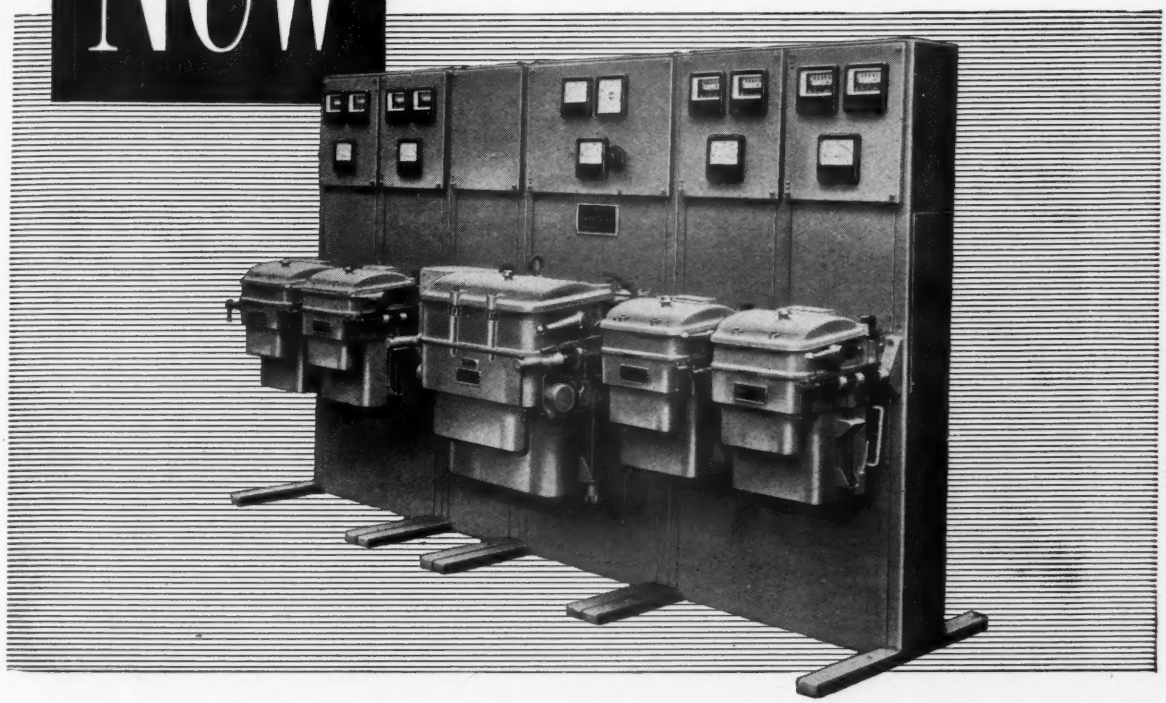


Further details are given in Publication No 309. May we send you a copy?

These boxes are supplied with a cast iron outer box for complete protection against damage. An iron protective box forms an additional earth electrode.

BRITISH INSULATED CALLENDER'S CABLES LIMITED
21 Bloomsbury Street, London, W.C.1

New *and craftsman built . . .*



ELLISON GEO switchgear

* High technical excellence at industrial prices.
* Robustly constructed for many years of dependable service.
* Designed for easy maintenance.

Planned and produced in the Ellison tradition, this new GEO range of electric switchgear upholds, in every way, the Company's reputation for reliable pedigree products. Circuit breakers have reversible main and arcing contacts, free handle on overcurrent and series connected, solenoid-operated overcurrent releases with time lags. Auxiliary switches can be fitted on site. For further information please ask for Leaflet C.L.244.

CIRCUIT BREAKERS Horizontally isolated, draw-out type for service voltages of up to 660.	
CURRENT RATING	**OVERALL WIDTH**
400 amp. 600 amp. 800 amp. 1,200 amp.	20 inches 24½ inches 25½ inches 28½ inches

BREAKING CAPACITIES		
Size	Breaking Capacity at 600 volts	Breaking Capacity at 400 volts
400 amps. 600 amps. 800 amps. 1,200 amps	37·5 MVA 45 MVA 45 MVA 45 MVA	25 MVA 30 MVA 30 MVA 30 MVA

TRADE (E) MARK
GEORGE ELLISON
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A.S.T.A. TESTED TO BS. 116:1952

Continuing a Tradition

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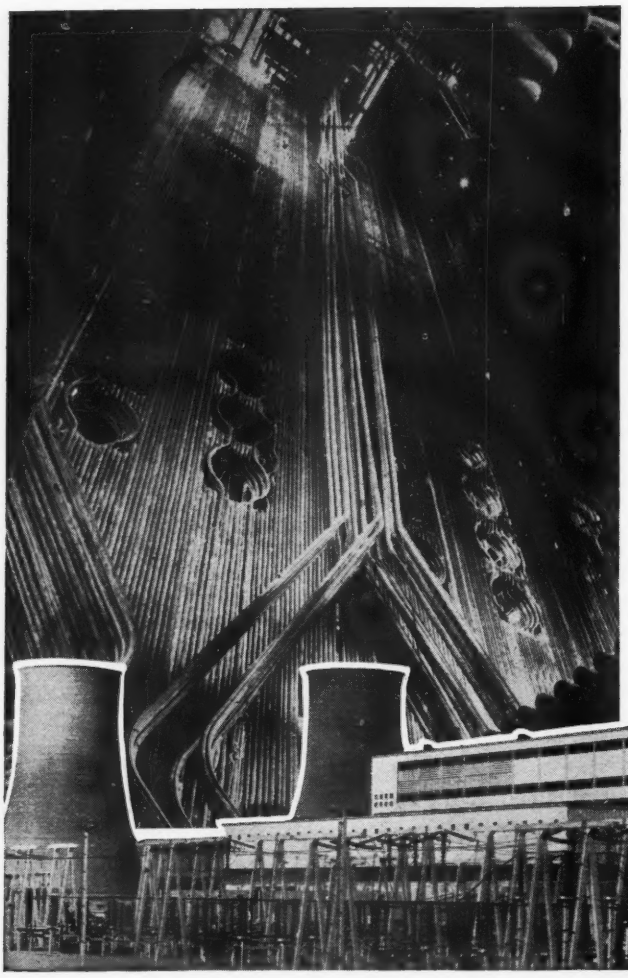
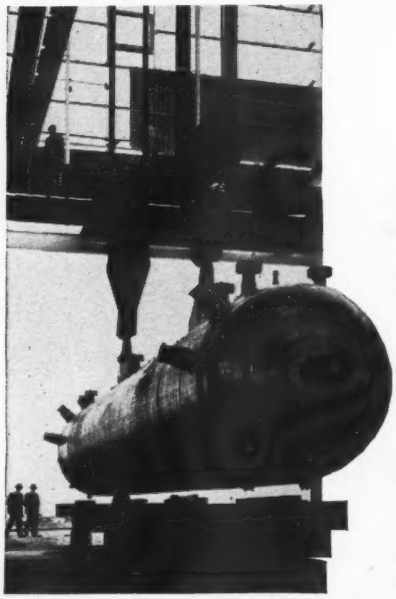


Largest boiler units operating in Europe are

BABCOCK

Castle Donington power station, now feeding into the 132 kV Grid will also feed into the 275 kV Supergrid.
Left: View into boiler furnace during erection.

Below: Lifting one of the boiler drums, weighing 90 tons, to a height of 123 feet.



830,000 lb. per hr./100 MW units at Castle Donington

CASTLE Donington (C.E.A., East Midlands Division), is the first power station in Europe with single boiler/turbine units of 100 MW rating and its boilers are the largest in operation in Europe.

Ultimately there will be six pulverized-fuel-fired, twin-furnace, Radiant-type boilers each with a capacity of 830,000 lb./hr. M.C.R., supplying steam at 1,600 lb./sq. in. and 1060°F. The coal-handling plant serving this installation is the largest in Britain, with a designed capacity of 960 tons/hr.

The whole of the boiler plant, including the thirty type-E coal-pulverizing mills and the entire soot-blowing installation, the coal-handling plant and the 'Hydrojet' and 'Hydrovac' ash and dust-handling systems, are of BABCOCK design and manufacture.

The Company has subsequently received orders for boilers of twice this capacity, to steam 200 MW generators, and is engaged in the design of even larger units. Such is the progress of technical development—but always with BABCOCK in the front rank.

BABCOCK & WILCOX LTD., BABCOCK HOUSE, 209 EUSTON ROAD, LONDON, N.W.1

13 SEPTEMBER
1957

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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New Manchester Grid Point 443 — The equipment of the new grid supply point in the Manchester City Centre is described

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British Association 451 — Abstracts of papers presented at the Association's annual meeting held in Dublin

Power for Steel Production 469 — Plant for a cold cut-up line at the Abbey works of the Steel Co. of Wales, Ltd.

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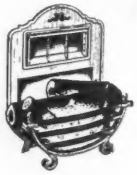

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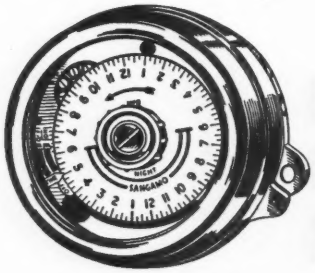

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ELECTRICAL REVIEW

13 September 1957 Vol. 161 No. 11 Established 1872

B.E.P.C.

THE British Electrical Power Convention was inaugurated in 1949 under the Presidency of Lord Citrine who in his address to the delegates expressed the hope that it was to be the first of a long succession of such conferences. He stressed the importance of this get-together of all sections of the electrical industry to co-operate with, and learn from each other.

There are numerous occasions when particular sections of the industry can meet in furtherance of their respective activities. The professional electrical engineers meet to present and discuss learned papers at their Institution; the salesmen of the industry have their occasions to meet and discuss problems of marketing, and in between these two extremes there are many gatherings of members of particular associations and groups. The B.E.P.C., however, is unique in that it is the one occasion of the year when all these individual units come together to " co-operate with, and learn from each other."

We consider that to eliminate any section of the industry from the Convention must weaken its value and it is for this reason that we view with apprehension the provisional decision that there should be no exhibition held in conjunction with the 1958 Convention. Eliminate the exhibition and at once the justification is removed for many people to attend at all.

Many, especially amongst the younger members of the industry, come because they have a job to do in connection with the exhibition and with their disappearance from the field will go the one opportunity which they have hitherto had of meeting all other members of the industry, including the leaders, at the various social functions.

The disappearance of the exhibition and all that it implies could, in our opinion, leave the Convention as little more than a professional meeting for professional engineers and senior executives, and no longer representative of all interests.

If, as we suspect, cutting out the exhibition has been prompted by considerations of economy in the interests of manufacturers, then we doubt if this object will, in fact, be achieved. We know, already, that some manufacturers intend to put on displays of their own. This alternative is not likely to be confined to one or two and we shall inevitably revert to the very kind of scramble for more accommodation for separate displays which the existence of a well-run collective exhibition has been so effective in discouraging.

If no stronger arguments against an exhibition exist than those we have so far heard, then we are not satisfied with the wisdom of the decision and strongly recommend to the B.E.P.C. Council that the matter should be reconsidered.

D.C. LINK WITH FRANCE

The advantages of exploiting differences in diversity, whether in production or use of electricity, between this country and France, have been obvious for many years. When investigations were started in 1951 into the feasibility of providing a link across the Straits of Dover, the only practicable way open was to lay 3-phase cables on the bed of the Channel. That method provided the basis for proposals in a paper presented in 1954 before the Institution of Electrical Engineers by Messrs. D. P. Sayers, M. E. Laborde and F. J. Lane, who also referred to the merits of d.c. in enabling power flow to be regulated independently of frequency.

Since then advances in cable designs and in power and voltage ratings of a.c./d.c. reciprocal convertors have exceeded expectations and have proved reliable in operation in the 100 kV Sweden—Gotland scheme. These developments provide ample justification for the decision reached twelve months ago to adopt d.c. for the cross-Channel connection which, as reported in this issue, has now received the formal approval of the Minister of Power.

EXPANSION AND SPACE

The article in this week's issue on the new grid supply point in Manchester illustrates the rapid growth of load in our large industrial centres. Three 60 MVA transformers have been installed at the new supply point, which forms only the first phase of a major plan for the reinforcement of the e.h.v. network in the Greater Manchester Area.

It is a generally accepted fact throughout the electricity supply industry to-day that the nation's power demands are expected to double roughly every ten years. Although there were many engineering problems to be overcome in the construction of the new Manchester supply point, the North Western Board was fortunate in having an old power station building at its disposal. The need for bulk supply points in other large industrial towns throughout the country is inevitable and it is almost certain that many of them will not find it so easy to solve the space problem, particularly in the town centres.

RAILWAY ELECTRIFICATION

We think that by writing the article "Modern Locomotives," which is published elsewhere in this issue of the *Electrical Review*, Mr. C. M. Cock has done an excellent service to the electrical industry in this country. We here are not very "railway electrification" minded, and it is therefore most useful to have some explanation of the traffic, track and speed influences on design.

There is one point, however, in which we feel inclined to take issue with Mr. Cock, although we feel somewhat hesitant to do so because of his authoritative position in the railway world. He says early in his article that he does not intend to compare the merits of electrification against diesel traction, and that "there is no real competition in these matters, for each has its particular attraction or sphere depending on the relative economies obtainable and the local conditions." Our observation on this is that a major part of the modernisation programme for British Railways provides ultimately for full-scale electrification and that diesel traction is only being adopted as a "halfway house" to full railway electrification.

CAUSES OF FIRES

The number of fires in buildings that were attended by fire brigades in 1955 reached 50,000, the highest yet and exceeded the 1951 figure by nearly one-fifth. In "Fire Research," issued by the Department of Scientific and Industrial Research (H.M. Stationery Office, price 4s), those attributed to electricity increased by one-ninth. During that period over one-third more electricity was consumed. This should not be regarded as satisfactory, however, since the proportion of electrical fires to the whole remains almost the same, and the investigation initiated by the Fire Research Board is therefore to be welcomed.

Presumably the increase in the number of fires believed to be of electrical origin is due mainly to misuse of apparatus or to indirect mischance rather than to defects in material, since those ascribed to wires and cables, for instance, have tended to become fewer, whereas heaters were involved in more instances. Thus the need to guard night-storage concrete and block heaters from contact with combustible material is emphasised in the report. Significantly perhaps, "other apparatus" than the usual main domestic applications was responsible for twice as many incidents as they were four years ago.

STANDARDS AND EXPORT

The value of British Standards, recognised for more than half a century as a means of tendering on a common basis in this country, is becoming increasingly greater in view of their bearing on the export of electrical goods. The tendency in many countries to initiate or add to the number and scope of national specifications, as pointed out in the annual report of the British Standards Institution (reviewed in this issue), makes high-grade representation on such bodies as the International Standards Organisation and the International Electrotechnical Commission of ever-growing importance.

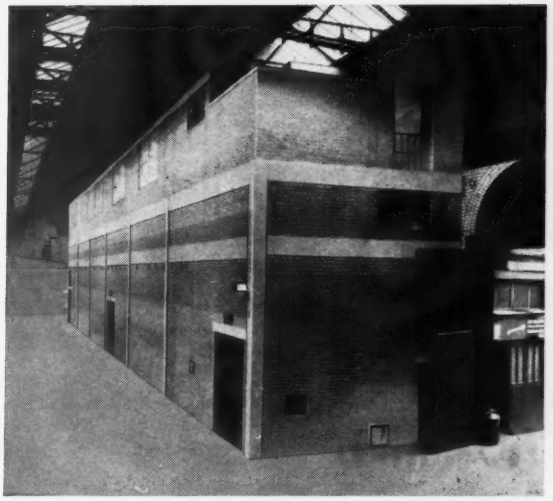
The aim should be to secure international acceptance, with as few modifications as possible, of flexible British Standards based on extended experience and previously aligned with practice in other Commonwealth countries.

FUEL AND WATER ECONOMY

Savings of as much as 50 per cent in both fuel and water have been found by the D.S.I.R. Building and Research Establishment to result from the substitution of spray taps for the usual pillar taps for washing. This test was carried out in an office building accommodating a staff of over a thousand persons where previously more than a million gallons was required each year with a consumption of fifty tons of solid fuel. The use of spray taps, supplying blended hot and cold water at 105 deg F at a rate of four or five pints a minute, is regarded as entirely satisfactory and as more hygienic than the usual practice. It seems to us likely that their advantages would be even more pronounced and the plumbing costs less with comparatively small local electric water heaters.

NEW MANCHESTER GRID POINT

REINFORCEMENT OF SUPPLY TO CENTRAL AREA



New substation in the old engine room at Dickinson Street

ELECTRICITY supply to the centre of Manchester, one of the world's most important trade centres, has been very substantially reinforced by the provision of a new grid supply point in the city centre. Dickinson Street is the site of the original generating station built by Manchester Corporation. The station was commissioned in 1893 with an installed plant capacity of 1,320 kW, the d.c. dynamos being belt driven by vertical reciprocating engines supplied with steam from four Lancashire type boilers at 120 lb/sq in. Expansion was rapid and by 1905 the plant had been replaced twice and the generating capacity had increased to 9,100 kW. In 1901 a new station had also been brought into commission on an adjacent site in Bloom Street.

In 1905 the second phase of development started at Dickinson Street, when rotary converting plant was installed to convert the 6,600 V a.c. supply from the new Stuart Street station to d.c.; the converting plant reached a peak capacity of 23,400 kW by 1924.

The third phase of development saw Dickinson Street become a major d.c. transforming and distribution station. In 1924 the first 33 kV feeder from the new Barton station was commissioned, and by 1932 four 33 kV cables linked Dickinson Street with Barton and the total 33/6·6 kV transforming capacity had reached 27,000 kVA. There were extensions in 1938 and 1952 which brought a further increase in transformer capacity.

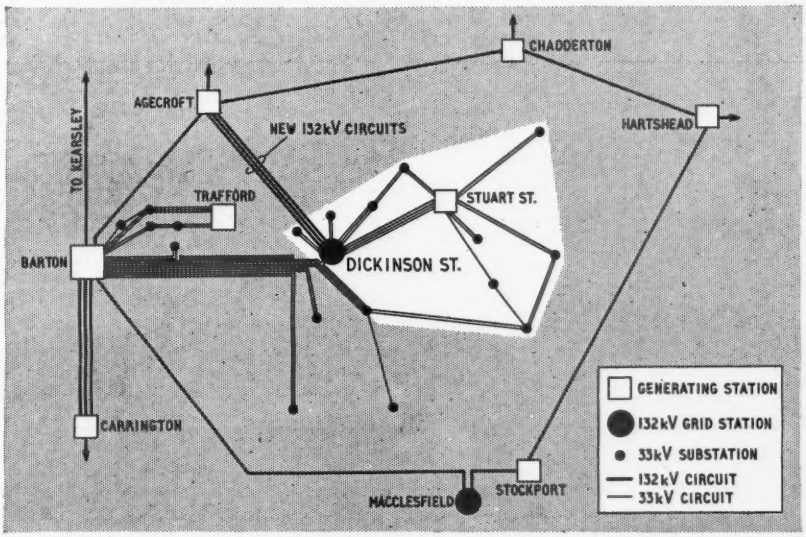
Up to then, the 33 kV system supplying the Manchester area and interconnecting the Barton, Trafford and Stuart Street generating stations with a combined installed capacity of 401,250 kW had been linked with the grid only at Barton. This single link became far too slender, in relation to the demands on the system, to permit economies and satisfactory operation, or to allow adequate imports of energy into the system in the event of the breakdown of plant at times of peak load.

Function of the New Supply Point

The primary function of the new supply point is to provide reinforcement of supply into the Manchester area. As will be seen from the diagram, the new point will enable the former supply area to be split into two, the western half, including Barton and Trafford stations, being connected with the grid at Barton, and the eastern half, including Stuart Street, interconnected with the grid at Dickinson Street. Besides increasing supply capacity, this splitting of the system brings with it operating advantages and solves a fault level problem. It also permits some of the 33 kV cables from Barton, previously used as trunk feeders, to be used to reinforce the distribution system in the western half of the area.

By running the 132 kV mains from Dickinson Street to Agecroft an additional outlet has been provided for the energy generated at the new station, which would otherwise have necessitated reinforcement of the grid lines forming a ring round Manchester.

Three 132 kV feeders, overhead for 1½ miles and underground for 3½ miles of their



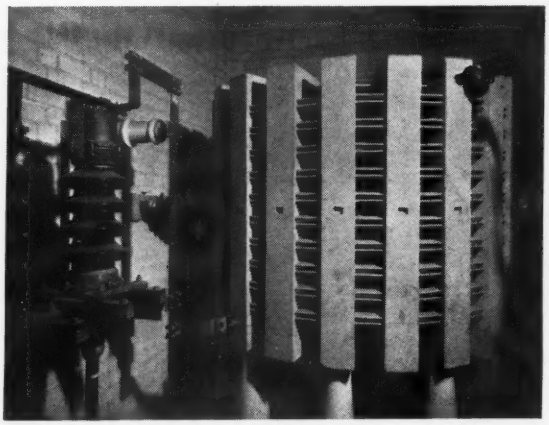
System diagram: shaded portion shows the area previously connected to the grid at Barton and now transferred to the new grid supply at Dickinson Street

length, connect Dickinson Street with the 132 kV grid at Agecroft. Each feeder terminates at a 60 MVA transformer housed in the old Bloom Street station building adjacent to Dickinson Street. From there, short lengths of 33 kV cable run to the switchgear installed in the new substation.

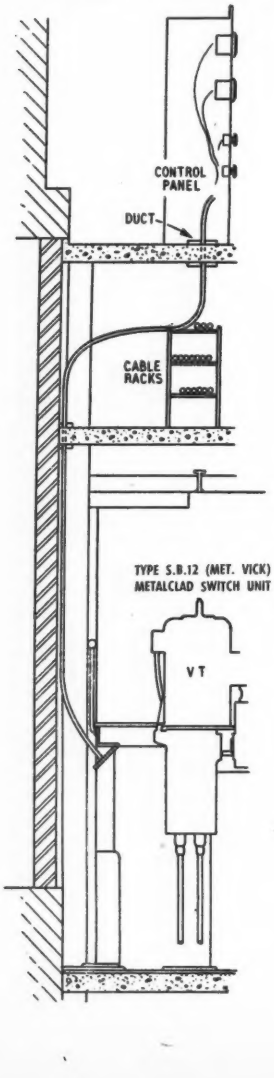
The North West, Merseyside and North Wales Division of the C.E.A. has been responsible for providing the switching equipment at Agecroft power station, the circuits from Agecroft to Bloom Street, transformers at Bloom Street, and the cables between the transformers and the switchgear at Dickinson Street.

The contract for the supply and installation of the 132 kV cables was placed with W. T. Henley's Telegraph Works Co., Ltd. Under this contract, three 132 kV, three-core cables were laid on a $3\frac{1}{2}$ mile route. They are oil-filled cables, with 0·2 sq in copper conductors, paper insulated and screened, three cores laid up with oil ducts of steel strip spiral in each interstice, lead alloy sheathed, reinforced with tin-bronze tapes, and anti-corrosion protection overall. They are designed to operate at maximum stress of 100 kV/cm. The overall diameter is approximately $4\frac{1}{4}$in and the cable weighs nearly half a hundredweight per yd. Average lengths of sections between joints is 348 yd and the drums containing this length weighed about eleven tons gross.

The three feeders were laid with two cables at the bottom of the trench, spaced 18in apart, with the third 13in above them. The normal trench depths were 4ft 2in in footpaths and 4ft 8in in roads, but because of the congested nature of the route it was necessary to drive some fairly deep and lengthy headings under roads. The route crosses Oxford Street, where it was necessary to sink shafts to a depth of 25ft and drive a heading 145ft in length. Five other similar headings were constructed for taking the cables under major roads. These included a 325ft long tunnel at Lower Mosley Street. Four 7in internal diameter earthenware cable ducts, into which the cables are drawn, are laid in each of the tunnels which have been completely back filled with concrete.

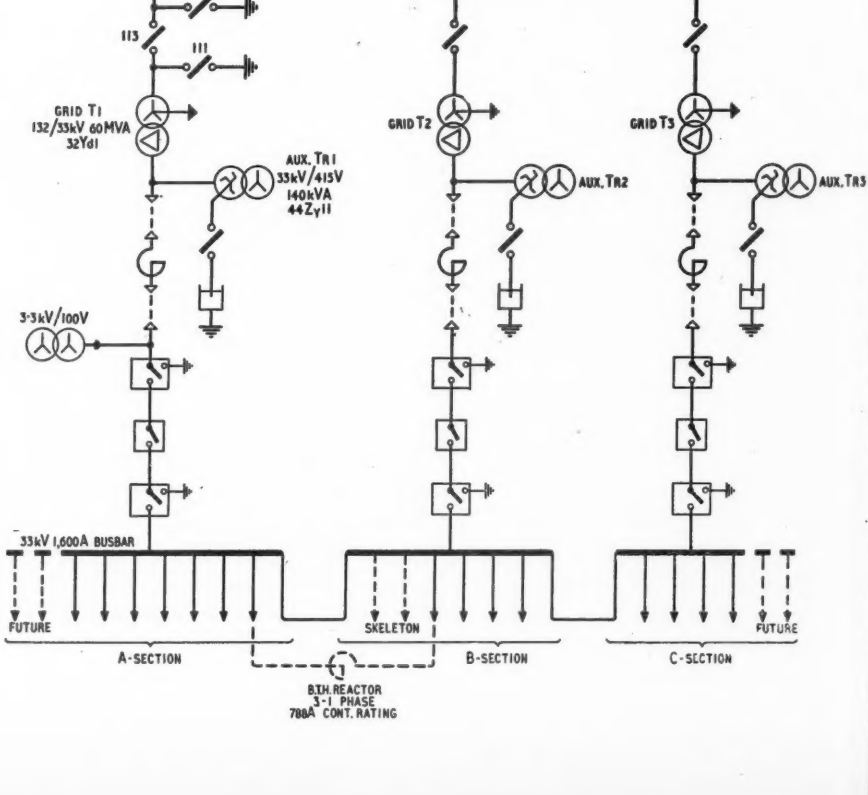


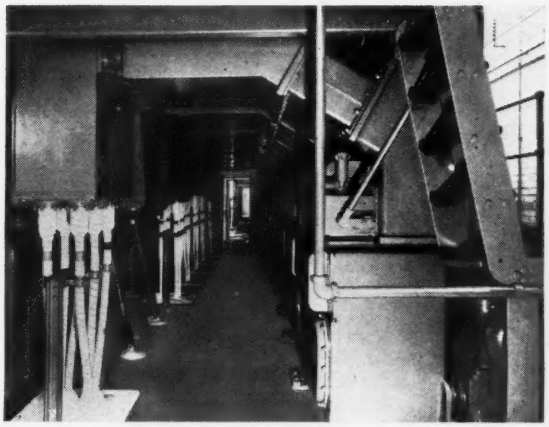
One of the three 33 kV cast-in-concrete reactors



Left: Sectional view of substation building

Key diagram of main connections at Dickinson Street 33 kV substation





Rear of 33 kV switchgear showing cables

The maximum static oil head occurs at one of these headings, the difference in level between this point and the highest point of the route being about 100ft. Oil pressure in the cable is maintained by pre-pressurised tanks feeding into the cable trifurcating boxes at each end of the route.

Each feeder contains seventeen straight-through joints and terminates at a 132/33 kV 60 MVA grid transformer housed in the old Bloom Street station building and from there short lengths of 33 kV cable run to the switchgear installed in the new substation.

All the cables, including multi-core cables, are unserved where fire hazard exists. In general, it is the practice of the North Western Electricity Board to wrap all cables in the switch-house with an asbestos tape, the tape being finished with a fire-resisting paint which prevents oil becoming absorbed into the asbestos. Asbestos piping which is normally used in place of earthenware ducting in switch-houses is treated in the same manner.

33 kV Substation

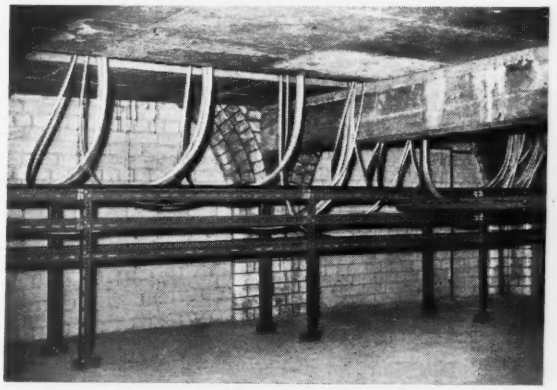
A new building had to be specially constructed on the floor of the engine room of the original Dickinson Street station to house the 26 panel switchboard, together with the control and relay equipment and CO_2 fire-fighting apparatus. Owing to the nature of the foundations a steel-framed building was specified and, after erection, all the steelwork was encased in concrete and the floors cast *in situ*. Finally, the spaces between the stanchions were filled with brickwork.

It will be seen from the sectional view of the building that the 33 kV switchgear is installed on the ground floor; the control and relay equipment is housed in a relay room at the top of the building with a multi-core runway between the switch-house and the relay room. The relay room is designed to accommodate not only the control and relay panels for the new 33 kV switchgear but also those for the 33 kV switchgear already installed elsewhere in Dickinson Street, and for all the existing 6·6 kV control panels which will eventually be moved to their new position.

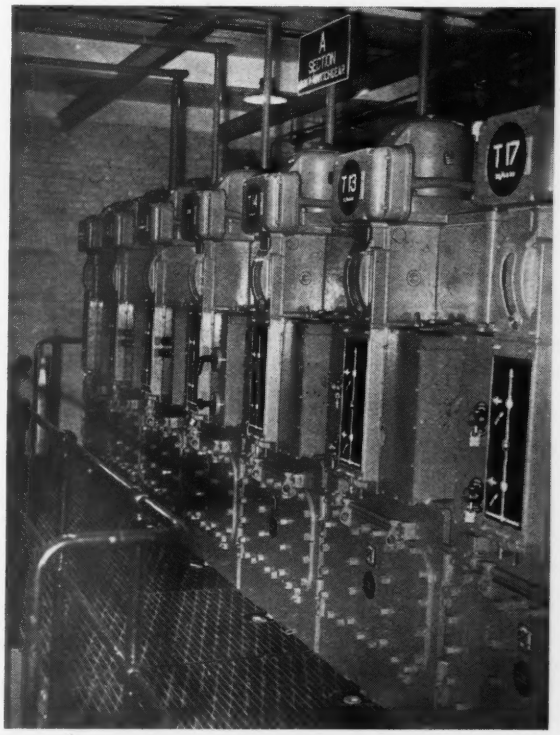
Switchgear and Ancillary Equipment

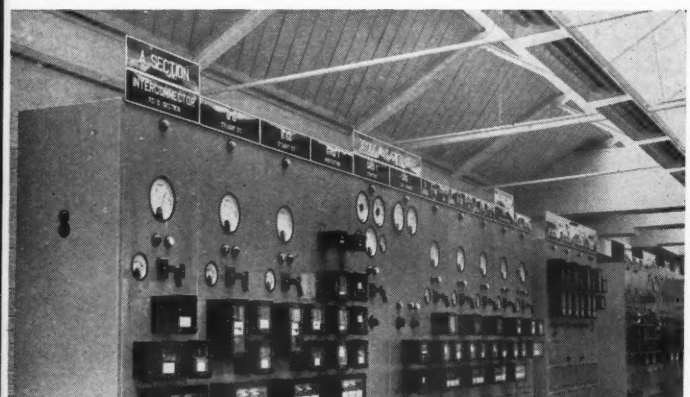
As the North Western Electricity Area is so industrialised and densely populated, 33 kV indoor gear is normally required. The Board has standardised on single-bus gear and therefore mimic diagrams for isolator and oil circuit-breaker indication are not considered necessary. In this particular case, the 33 kV switchgear is Metropolitan-Vickers 750 MVA, non-phase segregated single busbar SB12 and SB16 gear with armoured condenser-bushing busbars in place of the more conventional compound-filled type. This gear incorporates built-in busbar and feeder earth facilities. The switchgear is split up into three sections with two bus section switches connecting them. There are thus five separate chambers in the switch-house, all divided by brick walls with fireproof doors. In accordance with the Board's normal practice, the control and relay cubicles are 2ft wide and 7ft 3in high, the instruments are flush, and relays are of the projecting type. All the 33 kV feeder units are provided with translay and normal overcurrent back-up protection. Transformer units have overcurrent and balanced earth fault protection and standard protection.

Multi-core cable trays in middle section of building between switchgear and control room



Some of the 33 kV switchgear at Dickinson Street





33 kV control and relay panels

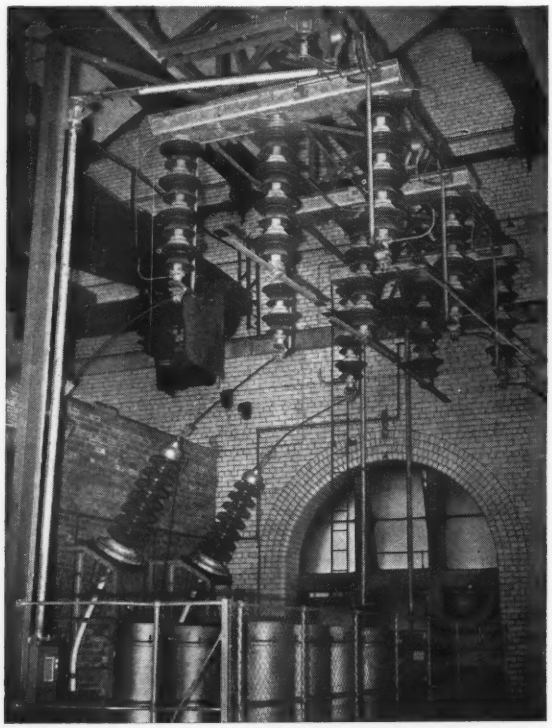
Because the relay room is close to the Manchester central supervisory control room it was considered necessary to provide only a single general alarm for any abnormality. The central control room is permanently manned and on receipt of the alarm a control engineer can ascertain the cause of the trouble by visiting the relay room a few yards away.

It will be seen from the schematic diagram that each grid circuit is equipped with a series reactor of the cast-in-concrete type, its purpose being to give a fault level on the 33 kV board of 750 MVA. This substation is normally operated as two systems, one to feed the 6·6 kV local system in the vicinity of Dickinson Street and the other as a direct "in feed" to the existing 33 kV system in the central area of Manchester. The two systems are loosely coupled through an inter-bus reactor which limits the 33 kV fault level under all conditions to 750 MVA. In the event of the loss of one grid transformer, standby capacity is provided from the other system.

The substation has an ultimate capacity of 26 units; this number is made up of fifteen feeder units, three incoming units, three transformers, two bus section units and three units for interconnectors. This installation at Dickinson Street intake point forms the first phase of a major plan for the reinforcement and rearrangement of the 33 kV network in the Greater Manchester area which is expected to take at least five years to complete.

Acknowledgment is due to Mr. H. G. Bell, chief engineer, North Western Electricity Board, and his staff, for their assistance in the preparation of this article.

The principal contractors for the project were: 132 kV switchgear at Agecroft and Bloom Street and 33 kV switchgear at Dickinson Street, Metropolitan-Vickers Electrical Co., Ltd.; 132 kV overhead lines and cables and 33 kV cables, W. T. Henley's Telegraph Works Co., Ltd.; 132/33 kV transformers at Bloom Street, Ferranti, Ltd.; reactors, British Thomson-Houston Co., Ltd.; civil work at Bloom Street, David Walton & Co., Ltd.; demolitions, James E. Turner, Ltd.; structural steelwork, Heenan, Beddow & Sturney, Ltd.; civil work at Dickinson Street, Normanton, Jones & Co., Ltd.; fire protection at Bloom Street, Mather & Platt, Ltd.; CO_2 fire-fighting equipment at Dickinson Street, Walter Kidde Co., Ltd.; tripping and closing batteries, Britannia Batteries, Ltd.; multi-core cables (N.W.E.B.), Mersey Cable Works, Ltd.; metering equipment, Landis & Gyr, Ltd.



The 132 kV isolators in the old Bloom Street engine room

Overhead Line Conductors

THE recent publication of B.S. 672 completes the work of revising the British Standards for overhead power line conductors. The series now consists of B.S. 125 : 1954, B.S. 215 : 1956, Parts 1 and 2, and the present B.S. 672 : 1957, dealing respectively with hard-drawn copper, hard-drawn aluminium, steel-cored aluminium and cadmium-copper conductors.

The principal changes made in the revision of B.S. 672 are a reduction in the minimum conductivity of hard-drawn cadmium-copper and the adoption of the Centigrade temperature scale. The new value of conductivity is 79·2 per cent of that adopted by the International Electrotechnical Commission for "standard annealed copper" and it corresponds with the maximum resistances specified for standard conductors since 1941 when the earlier edition of the standard was amended.

The number of standard conductor sizes has been reduced and the testing procedure has been brought into line with that adopted for aluminium conductors in the recent revision of B.S. 215. Copies of this standard may be obtained from the British Standards Institution, 2, Park Street, London, W.1, price 5s.

Institute of Metals Meeting

The 1957 autumn meeting of the Institute of Metals will be held in Scotland from 16th to 20th September, at the invitation of the Scottish Local Section of the Institute. The meeting will be centred on Glasgow, but a day will also be spent in the Edinburgh area. Particulars may be obtained from the secretary of the Institute, 17, Belgrave Square, London, S.W.1.

I.E.E. Section Chairmen

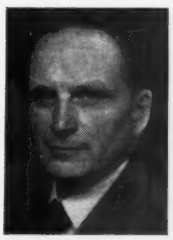
OFFICERS FOR THE 1957-58 SESSION

THE London meetings of the Institution of Electrical Engineers for the 1957-58 Session will commence on 3rd October when Mr. T. E. Goldup, the President, will deliver his inaugural address. An outline of Mr. Goldup's career, together with his portrait, was published in our issue of 12th July, and following our custom, we now give biographical notes and the portraits of the men who will preside during the Session over the specialised Sections of the Institution.

Mr. H. S. Petch, B.Sc.(Eng.), M.I.E.E. (Measurement and Control Section), is meter and testing engineer with the London Electricity Board. He studied at East London (now Queen Mary) College, and after a short period with Siemens Brothers & Co., Ltd., at Woolwich, became relay and protection development engineer at the Willesden works of the British Thomson-Houston Co., Ltd., in 1924. He joined the London Electricity Supply Corporation, Ltd., in 1928 as meter and testing superintendent, and continued with the Corporation until nationalisation when he was appointed to the position he now holds. Mr. Petch was a member of the Electricity Supply Productivity Team which visited the United States in 1949.

Mr. H. S. Petch

Mr. J. S. McPetrie, Ph.D., D.Sc., M.I.E.E. (Radio and Telecommunications Section), is head of the Radio Department, Royal Aircraft Establishment, Farnborough. He was born in Aberdeen and received his education at Aberdeen University. From 1925 to 1943 he was engaged in the Electricity and Wireless Divisions of the National Physical Laboratory, Teddington, and in the following year was radio physicist to the British Supply Mission, Washington, U.S.A. In 1944 he was appointed research superintendent of the Signals Research and Development Establishment, Christchurch, and he took up his present position at Farnborough in 1950.



Dr. J. S. McPetrie

Professor M. G. Say, Ph.D., M.Sc., A.C.G.I., D.I.C., M.I.E.E., F.R.S.E., M.Brit.I.R.E. (Supply Section), has been Professor of Electrical Engineering at the Heriot-Watt College, Edinburgh, since 1933. He was born in London and was educated at Colfe's School, Blackheath, and the City and Guilds College, South Kensington; he was a D.S.I.R. student bursar. From 1924 to 1928 he served as research assistant to Professor S. Parker Smith, and he was appointed lecturer at the Royal Technical College, Glasgow, in 1928, a position which he held until going to the Heriot-Watt College. His Institution activities have included the chairmanship of the Scottish Centre (1949-50), membership of the Supply Section Committee (1950-53), and membership of the Council (1952-55). He is the author of a number of books dealing with a.c. machine design, electrotechnology, electrical engineering design (with Professor Parker Smith), and stage lighting.

Prof. M. G. Say

Mr. J. Vaughan Harries, M.I.E.E. (Utilisation Section), was born in Treharris, Glam, and commenced his working life at the age of thirteen at the Deep Navigation Collieries, later entering the Engineering Department. During the 1914-18 war he served in the 18th Hussars and Royal Tank Corps. Upon returning to civil life he became a colliery electrician, gaining experience during the electrification of the Deep Navigation Collieries and the building of the Treharris central power station. In 1928 he moved to Ynysybwl as chief electrician, Lady Windsor Collieries.

He joined the South Wales Electrical Power Distribution Co. in 1931 as an electrical engineer in the frequency change department. He was later transferred to the commercial department of the South Wales Power Co., dealing in particular with contracts covering supplies to bulk undertakers and industrial concerns. He was appointed to his present position, district manager to the Brush Electrical Engineering Co., Ltd., in 1945.

Mr. J. Vaughan Harries

Mr. Vaughan Harries has served as a member of the I.E.E. Council, has been chairman of the Western Centre of the Institution and has served for seven years as hon. secretary of the Centre; he has also been chairman of the Centre Utilisation Group. His other activities have included membership of the General Council of the Association of Mining Electrical and Mechanical Engineers for over twenty years; he was president in 1953-54. He is a member of the Welsh Joint Education Sub-Committee and was recently elected to the board of the new College of Advanced Technology for Wales; he is chairman of the Advisory Committee on Electrical Engineering of that body. A keen musician, his services have for many years been in demand as a conductor at music festivals.

Lead-Acid Starter Batteries

THE International Electrotechnical Commission has issued a first edition of recommendations regarding lead-acid accumulators, rated at 6 and 12 V, for use primarily for providing starting and ignition current for internal-combustion engines. The publication of 20 pages (No. 95) is obtainable from the I.E.C., 1, rue de Varembé, Geneva, at 6 Swiss francs, plus postage. Its contents include composition and specific gravity of electrolyte, rapid discharge rates at normal and low temperature and tests for checking these and other characteristics. A section is allocated to electrical measuring instruments.

Modern Electric and Diesel-Electric Locomotives

By C. M. COCK, M.I.Mech.E., M.I.E.E.*

Track, Traffic and Speed Influences on Design

IT was known and proved well over 100 years ago that electricity could be used for traction. The methods that were tried then were ingenious but crude compared with present-day standards, and it was not until about the turn of the century that electric traction was established sufficiently to be accepted as a practical and economic substitute for the reciprocating steam locomotive. The diesel engine was applied to traction nearly 50 years ago in Europe and perhaps became really established when, in 1934, on the 1,017-mile run between Denver and Chicago, the Burlington-Zephyr diesel-electric train averaged 77·6 m.p.h. Since those early days development and progress have followed differing patterns in Europe and in the United States of America.

The trend in Europe has been mainly towards electrification, outstanding examples being Switzerland, Sweden and Holland, in which countries the great bulk of the rail traffic is worked by electric traction. Many other countries, of course, have extensive suburban and main line electrification systems and in recent years in some of the same countries diesel traction also has appeared and is extending.

The value of railway electrification as a capital investment is determined by savings in working expenses, but it may be found desirable or even necessary for other reasons not always economic. For example, in some countries there is an abundance of water power and a shortage of fuel, while in others increase in line capacity, improved performance on heavy gradients and smoke abatement may be important. The cost of the fixed equipment for electrification is, however, high and generally a heavy traffic density is necessary to justify this cost. The successful development of single-phase a.c. traction at standard frequency has enabled electrification to be carried out economically at somewhat lower traffic densities than hitherto.

The value of diesel traction as a capital investment is also determined by savings in working expenses as compared with steam, but it is not necessarily related to traffic density. Economically, and otherwise, it has shown so much success in the United States, and indeed in other countries, that there has in recent years been a complete change of railway policy, so that even in countries where coal is cheap and traffic is light the trend is towards diesel traction. As the railways of the world are now so vitally interested in both electric and diesel traction a short review of modern trends in the design of locomotives is timely. It is not proposed to discuss either the merits of one system of electrification as compared with any other system or to compare the merits of electrification against diesel traction. There is no real competition in these matters, for each has its particular attraction or sphere depending on the relative economies obtainable and the local conditions.

Track Considerations

There is a persisting trend to pull heavier trains at higher speeds, and in the design of locomotives to meet these conditions the main confronting problems arise from the weight and strength of the track, the track curvature and the load gauge. Even in Britain, with good and well maintained track, the weight of the rail imposes limits on the design of the locomotive. Many overseas railways have been built to poor standards to keep down the first cost of the permanent way itself, regardless of the effect of this on the performance of the trains. In hilly and undulating country the lines follow the natural contours as far as possible, banks, cuttings, tunnels and bridging being reduced to the minimum. In the original permanent way of some railways, the weight of the rail, the sleeper spacing, and the ballast were sufficient only for bare necessity. Some railways have been built with no ballast at all.

Poor or light track imposes very considerable limits on axle loads and speeds and requires locomotives of refined or complicated and expensive design. Severe restrictions are imposed also in the operation of the train services; indeed cases can be quoted of luxury passenger trains with adequate and modern motive power being unable to compete with road transport because of the better schedule speeds of the latter even on routes

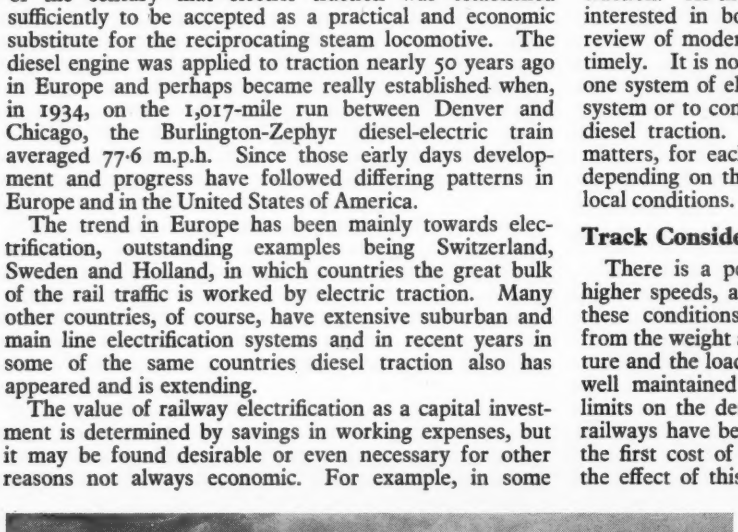


Fig. 1.—The most powerful single unit diesel-electric locomotive in the world is the 3,300 h.p. Deltic. Track gauge 4ft 8½in, wheel arrangement Co-Co, length over buffer beams 66ft 0in, overall width 8ft 9½in, overall height 12ft 10½in, rigid wheelbase 14ft 4in, weight in working order 106 tons, adhesive weight 106 tons, maximum axle load 18 tons, maximum tractive effort 52,500 lb, continuous tractive effort 23,500 lb, and maximum service speed 105 m.p.h.

* General Manager, Traction, of the English Electric Co., Ltd.

Fig. 2.—1,800 h.p. 1,500 V d.c. electric locomotive for New Zealand. Track gauge 3ft 6in, wheel arrangement Bo-Bo-Bo, length over couplers 62ft 0in, overall width 8ft 6in, overall height 11ft 9in, rigid wheelbase 8ft 6in, weight in working order 75 tons, adhesive weight 75 tons, maximum axle load 12·5 tons, maximum tractive effort 36,000 lb, continuous tractive effort 18,000 lb, and maximum service speed 60 m.p.h.

extending over some hundreds of miles. In general, it may be said that when a railway has to face up to improved services, either to meet competition from other forms of transport or to keep pace with national development, the track must be improved or the power of locomotives increased, or possibly both. Usually improvement in the permanent way involves very heavy expenditure and therefore many railway administrations, especially those in financial difficulty, would prefer to compromise on the objective by means of locomotives of greater power, possibly of complicated and expensive design, to operate on inferior track. Some railways, of course, notably in the U.S.A., are equipped with heavy rails and good foundations and no real problem arises with locomotive axle loads.

Throughout the world there are six main track gauges ranging from one metre to 5ft 6in, which is the broadest gauge. Structure or load gauges vary from about 90 sq ft to 160 sq ft in cross-sectional area and permitted axle loads vary from 10 to 30 tons per axle. Over the last half-century the horsepower per axle has increased tenfold and is now sometimes of the order of 1,000 h.p. Coupling and buffing arrangements have great differences. Braking is either air or vacuum operated dependent on the standard adopted in a particular country. In addition, it is sometimes desirable in mountainous regions to provide electric braking which can be either regenerative or rheostatic. These forms of braking are normally used as holding brakes on long gradients and do not replace the normal vacuum or air brakes which in any case are indispensable.

Two-Axle Double-Bogie Construction

Having outlined the basic problems that face the locomotive builder, it is proposed to consider a few general points in the design of both electric and diesel-electric locomotives and to discuss briefly some examples of modern construction. Electric locomotives have been built with a simple two-axle double-bogie arrangement (Bo-Bo) of about 4,000 h.p., weighing only 80 tons and representing a weight per h.p. of 45 lb. These locomotives are suitable for express main line passenger service with heavy trains of some 700 tons. Conventional diesel locomotives for a similar service would require a triple unit totalling 4,800 h.p. or even 6,000 h.p., using basic units of 1,600-2,000 h.p. each. Overall weights might range between 300 and 400 tons for the complete locomotive, representing 120 to 160 lb/h.p., and therefore a considerable expenditure of power is necessary to move the weight of the locomotive alone. Although these weights may seem excessive, they are in fact necessary under certain conditions. In the U.S.A. where heavy freight trains are worked, a train of 10,000 trailing tons is common and requires maximum rather than minimum adhesive weight of the locomotive.

With diesel-electric locomotives the weight and the general design are influenced by the type and weight of the engine itself. Medium-speed diesel engines, i.e. from 600 to 900 r.p.m., are generally used for traction with a h.p. range from 300 to 2,400 h.p. weighing from 16 to 30 lb/h.p., but the trend is towards high-speed engines running between 1,000 and 1,500 r.p.m. (and even higher) and weighing from 6 to 12 lb/h.p. With a high-speed engine a lighter generator becomes possible. Thus to carry less weight of power equipment, mechanical parts can be lightened and overall the use of a high-speed lightweight diesel engine results ultimately in more freedom in designing a locomotive that is cheaper and more suitable to poor or indifferent stock.

The British "Deltic" locomotive (Fig. 1) is an outstanding example of the advantages of lightweight diesel engines. Developing 3,300 h.p. from its two 18-cylinder diesel engines, it has a total weight of only 106 tons despite the inclusion of a train heating boiler. It is thus not only the most powerful single-unit diesel locomotive in the world, but also has the best power/weight ratio yet achieved with this form of traction, namely, 72 lb/h.p. The locomotive is carried on two three-axle bogies, each axle being individually motored.

Fundamentally, it is desirable to build a locomotive having two independent bogies with swing bolsters for good riding qualities and to drive all axles, thus using the total weight for adhesion. Double-bogie locomotives with two or three axles per bogie and with swing bolsters have proved satisfactory up to the highest speeds and sufficiently flexible to negotiate all normal curves.

For some of the reasons already stated it is not always possible to build locomotives with such simple wheel arrangements with an all adhesive weight, particularly on narrow gauge railways. In New Zealand, for example, locomotives of fairly high power have been specified for very light axle loadings and a very restricted load gauge—probably one of the most severe in the world so far as important main line railways are concerned. Electric locomotives (Fig. 2) have been built with a maximum axle loading of 12·5 tons and, to enable six motored axles to be provided despite the restriction of the sharply curved track, an unusual arrangement using three two-axle bogies supporting an articulated superstructure was adopted. This wheel arrangement has proved most

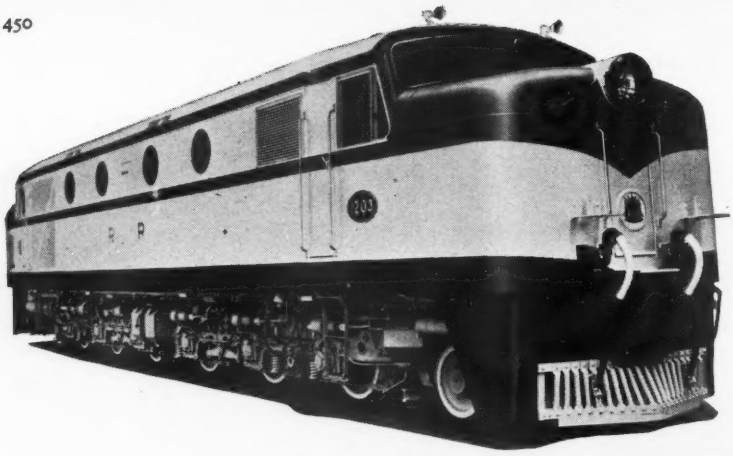


Fig. 3.—2,000 h.p. diesel-electric locomotive for Rhodesia. Track gauge 3ft 6in, wheel arrangement 1Co-Co1, length over buffer beams 54ft 6in, overall width 9ft 6in, overall height 13ft 6in, rigid wheelbase 13ft 0in, weight in working order, 113 tons, adhesive weight 90 tons, maximum axle load 15 tons, maximum tractive effort 60,300 lb, continuous tractive effort 36,000 lb, and maximum service speed 55 m.p.h.

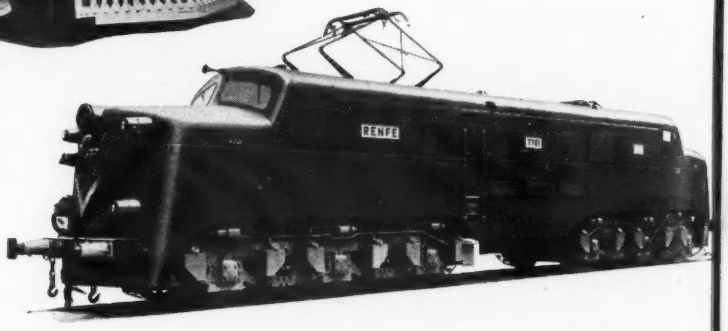


Fig. 4 (right).—3,600 h.p. 3,000 V d.c. electric locomotive for Spain. Track gauge 5ft 6in, wheel arrangement Co-Co, length over buffers 67ft 9½in, overall width 10ft 1in, overall height 14ft 0½in, rigid wheelbase 15ft 9in, weight in working order 118 tons, adhesive weight 118 tons, maximum axle load 20 tons, maximum tractive effort 67,000 lb, continuous tractive effort 30,500 lb, and maximum service speed 110 k.p.h.

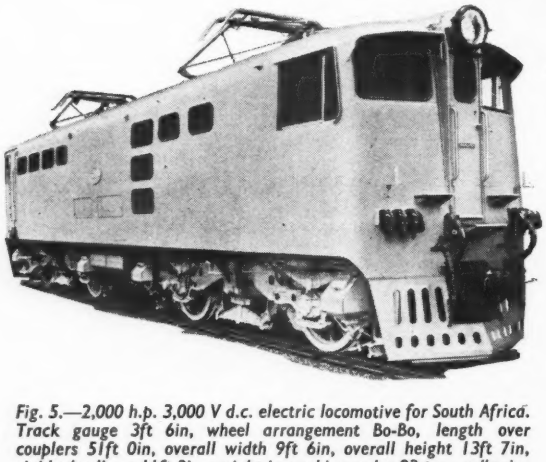


Fig. 5.—2,000 h.p. 3,000 V d.c. electric locomotive for South Africa. Track gauge 3ft 6in, wheel arrangement Bo-Bo, length over couplers 51ft 0in, overall width 9ft 6in, overall height 13ft 7in, rigid wheelbase 11ft 3in, weight in working order 83 tons, adhesive weight 83 tons, maximum axle load 20·75 tons, maximum tractive effort 55,000 lb, continuous tractive effort 23,100 lb, and maximum service speed 60 m.p.h.

successful both as regards riding qualities and life of tyres which run for approximately 200,000 miles between turning. A 1,500 h.p. diesel-electric locomotive, however, was a more difficult proposition. Owing to the extra weight of the diesel engine and its generator, four additional carrying axles were necessary, resulting in a 2Co-Co2 wheel arrangement with a maximum axle load of 11·75 tons.

It is believed that the 2,000 h.p. DE 2 class diesel-electric locomotives in Rhodesia (Fig. 3) are the most powerful yet built for a narrow gauge (3ft 6in) railway. These locomotives work all traffic on the steeply graded 170-mile section between Umtali and Salisbury. Their starting tractive effort is 60,300 lb and they have a 1Co-Co1 wheel arrangement to enable them to operate on the sharply curved track with a maximum permissible axle load of 15 tons. Twenty-three of these locomotives were supplied against the original order and construction of a further twelve has now commenced. Another example in Rhodesia of powerful locomotives with light axle loads, albeit weighing twice as much as the DE 2 locomotives, are the Beyer Garrett 20th class steam locomotives. These have a maximum axle load of 17 tons, a 4-8-2 + 2-8-4 wheel arrangement and a tractive effort of 69,330 lb.

A good example of the use of electrification to overcome the difficulties involved in working heavy traffic in mountainous areas may be seen in Northern Spain. Probably the worst section here is that from Ujo-Busdongo which has 70 tunnels and 156 bridges in its 38 miles length with sharp curvature and practically continuous ruling gradients of 1 in 50. This short section was electrified many years ago, but with the continually increasing heavy mineral and passenger traffic it was decided that

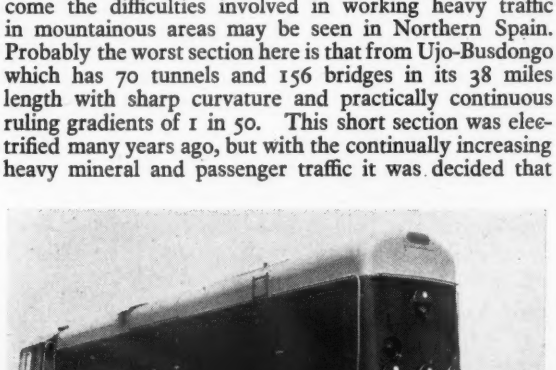


Fig. 6.—The first main line locomotive to be completed under the British Railways Modernisation Plan; 1,000 h.p. diesel-electric unit. Track gauge 4ft 8½in, wheel arrangement Bo-Bo, length over buffer beams 43ft 0in, overall width 8ft 9in, overall height 12ft 7⅛in, rigid wheelbase 8ft 6in, weight in working order 72 tons, adhesive weight 72 tons, maximum axle load 18 tons, maximum tractive effort 42,000 lb, continuous tractive effort 19,500 lb, maximum service speed 75 m.p.h.

more powerful locomotives were required and that the electrification should be extended. Sixty 3,600 h.p. locomotives (Fig. 4) have been supplied in recent years for the area and they will shortly be joined by a further fifteen. These locomotives have excellent riding qualities as a result of their carefully designed swing link three-axle bogies. In addition to the usual locomotive and train brakes, regenerative braking is provided to enable trains to be held on long down grades without the severe brake block wear that would otherwise occur.

The South African Railways operate one of the most extensive electrified main line systems in the world and are unique amongst narrow gauge railways in the high permitted axle loads and weight of trains hauled. Sixty 2,000 h.p. Bo-Bo locomotives (Fig. 5), each weighing 83 tons, have recently been supplied and a large number are at present under construction. On certain duties where heavy freight trains are hauled over steeply graded sections, as many as three units are coupled together and operated in multiple under the control of a single driver to form a 6,000 h.p. locomotive. As with the Spanish locomotives referred to above, provision is made for regenerative braking.

British Railways have recently taken delivery of the first main line locomotives to be built under the Modernisation Plan. These are 1,000 h.p. Bo-Bo mixed traffic diesel-electric locomotives (Fig. 6) and are the first of a batch of twenty. They have a single driving cab at one end but, by using a narrow bonnet type engine housing, good visibility is obtained and the locomotive may be driven in either direction from the single cab. To provide universal running rights the axle load is limited to 18 tons, and the combination of swing link bolsters with carefully proportioned coil primary springs and laminated elliptic secondary springs provides excellent riding up to the maximum service speeds. An unusual feature of these locomotives is that not only can two or more units be coupled together and operated in multiple, but it is also possible to operate in multiple with the larger and more powerful classes being supplied to British Railways.

Many of the world's railways were laid out in days when traffic was much lighter than it is to-day and much lower speeds were acceptable. The modern operator is faced with many difficulties as a result and an attempt has been made above to show how the locomotive builder has helped in the solution of some of the problems arising from these and other conditions. British locomotive builders supplied the first motive power for railways throughout the world and it is noteworthy that they are now in the forefront in designing locomotives to meet the many and various problems confronting the modern operator.

The British Association

PROCEEDINGS AT THE ANNUAL MEETING IN DUBLIN

ABOUT 2,000 overseas members of the British Association for the Advancement of Science assembled in Dublin on 4th September for the 119th annual meeting of the Association. Eire's Government organised a "Cead Mile Failte" (hundred thousand welcomes) for the visitors, and the streets of Dublin were lavishly decorated for the occasion.

Mr. Sean T. Kelly, President of the Republic, and Mr. Eamon De Valera, Prime Minister, arranged various receptions during the meeting. Mr. De Valera was present when Professor P. M. S. Blackett, F.R.S., gave the presidential address at the Royal Dublin Society showgrounds library.

Aid for Underdeveloped Countries

Professor Blackett dealt mainly with the part that could be played by the West in aiding the depressed countries of Europe and Asia. He thought the West should make the experiment of sacrificing some of its immediate prosperity to give massive aid to the underdeveloped countries. If the major nations of the West could not agree to provide quickly the £1,000 million required, then he hoped that Britain would "go it alone" and make a contribution of £150 million a year available to her former colonies in addition to what she was already doing.

Scientists and technologists had a special responsibility in this matter since it was their genius and their skill alone which could bring the material basis of happiness within the reach of all.

Admirable as many of the schemes of technical aid had been, particularly those in education, medicine and agriculture, the sending of experts to poor countries without the capital to carry out their plans, could be as irritating as to send a trained cook to a family unable to pay the baker.

Professor Blackett concluded with the words: "The uneven division of power and wealth, the wide differences of help and comfort of the nations of mankind, are the sources of discord in the modern world, its modern challenge and, unrelieved, its moral doom."

Energy and Power Supply

On 5th September, Sir Josiah Eccles, deputy chairman (operation), Central Electricity Authority, addressed the Engineering Section of the Association on "Energy and Power Supply." He said that the underground gasification of coal, pumped water storage and the projected submarine cable between the supply systems of France and Britain were some of the patterns of electrical power development in Britain to-day.

With the aid of diagrams of the geographical layout of coal, oil and water resources of the world, the author pointed out the various parts they played in the general supply of energy. From that point he went on to deal with the exploitation of electrical power in Britain, tracing briefly the development of the supply industry in the years immediately following the second world war. On this aspect, Sir Josiah indicated the growing trend towards higher steam pressures and temperatures, and the larger size of generating plant. The main features of the 200 MW turbo-alternator which would be used and would play an important part in the C.E.A. system a few years hence were also described. As part of the Authority's programme for 1962, a generating set having a capacity of 550 MW, which was believed to be the largest in the world, had been decided on. This aimed at effecting reductions in the cost of generation, and so did the increase

in the sizes of boilers. At the same time work continued on even more advanced machines for subsequent programmes.

Sir Josiah then pointed out that the primary fuel situation in Britain had forced the Authority to turn to the development of nuclear energy to make good the expected deficit of "fossil" fuels. He went on to describe the basic principles of nuclear fission and fusion, and discussed the main features of the gas-cooled, graphite-moderated reactor which was the type to be used by the C.E.A. in its initial nuclear power stations. The two commercial power stations already under construction at Bradwell in Essex and Berkeley in Gloucestershire were scheduled to come into operation in 1961. Work had begun on the station at Hunterston (Ayrshire). Work would also begin soon on an additional station at Hinkley Point (Somerset) and permission would be sought to site further stations in the country. It was possible that the next contracts placed would be for stations having an output capacity of 500 MW and perhaps even higher, so that fewer sites would be required to meet the enlarged programme.

The author then progressed to the difficulties likely to be encountered in the satisfactory siting of the nuclear stations. The natural disquiet over the spread of industrial development in rural areas was dealt with at some length by the speaker who said: "If Britain is to have the power required for the industrial expansion necessary to enable its people to enjoy a good standard of living, we must find a way to fit the nuclear installations into our countryside, holding a just balance between some interference with our existing amenities and the provision of electricity, which itself is perhaps one of the greatest amenities of Western civilisation."

Dealing with nuclear energy, Sir Josiah said that the fuel savings that would accrue from the improved thermal performance of generating plant, although substantial, would not be sufficient to make good the whole of the deficit in available coal supplies. The gap must be filled by imported fuels or by nuclear energy. The C.E.A. had made arrangements for fifteen of their power stations to burn fuel oil instead of coal and that would save about eight million tons of coal annually by 1960.

Sir Josiah Eccles said that work was expected to begin this year and to be completed by 1960, on the cross-Channel cable link between the electricity systems of Britain and France. The cable would be owned jointly, one half being manufactured in each country. It was estimated that substantial saving would accrue to both countries through its operation. The cost of the 31-mile cable link and its terminal stations on the French and British coasts was estimated at £4 million.

It was expected that the cable would have to carry up to 150 MW, transmitted as d.c. at 200 kV.

At the end of his paper, Sir Josiah replied to criticisms that scientists were in the process of producing a "push-button" community, and dealt with the needs of a civilisation governed by the expanding use of energy. Humanists and scientists should combine in the tireless and unceasing efforts to show that science and technology were but a means to an end, and that end should be a nobler, simpler, less oppressive life with more time for all the people to enjoy in leisure and reflection.

Engineering Heat Transfer

The use of liquid metals in industrial heat transfer generally was likely to grow, said Professor O. A. Saunders in his paper "Recent Developments in Engineering Heat Transfer." Heat transfer problems occurred widely throughout industry and their solution was often a key matter, he said. Recent years had seen many improvements in the design of conventional heat exchangers, but there had also been new problems which required novel methods of solution. The nuclear power reactor was a recent development which called for great ingenuity from the heat transfer engineer. The problem was novel in several respects. The permissible substances for use as coolants were few because of nuclear considerations. The requirements of high exit temperature of the coolant was difficult to reconcile with the use of metallic uranium, although the use of non-metallic fuel elements such as uranium carbide or uranium oxide might lift the maximum temperature allowable.

In the case of the gas-cooled reactor, the reduction of the pressure drop for a given heat transfer was very important, the pumping power for coolant circulation being very large.

Existing designs of finned cans enclosing the uranium would no doubt be improved so as to make the best possible use of turbulence, and would result in considerable increase in power and efficiency of power stations of the Calder Hall type. Increase in the static pressure of the coolant would also help. In future reactors, and especially fast neutron reactors, such as were more suitable for mobile power installations, the coolant would almost certainly be a liquid, as the space available for coolant circulation was strictly limited.

Much progress had been made with liquid metal coolants, such as the sodium-potassium alloy, which had exceedingly high heat transfer rates, although they suffered from lower specific heats than water or organic liquids. Those of liquid metals in industrial heat transfer were generally more likely to increase in use.

Professor Saunders said that a completely different heat transfer problem, common in combustion chambers and in turbine blades of gas turbines, was to reduce the heat transfer from a hot gas to a surface so as to protect the surface and sometimes to enable cheaper metals to be employed. There were few fundamental ways of reducing such heat transfer.

The use of a layer of poorly conducting gas in "effusion cooling" was an interesting new development which might find many applications; it had been used already in an industrial gas turbine chamber.

In conclusion, the Professor dealt with other highlights of recent times, including the control of radiation from luminous furnace flames, which he said was particularly important in the steel, cement, glass and boiler-making industries.

Technological Training

In a paper Mr. M. J. Cranley said that for some years past a three-year course in radio engineering had been operated successfully in Dublin. An interesting feature of the course was that from time to time groups of Irish Army engineers in the Signal Corps were seconded to attend the second year, and the great majority of the officers recruited to the Signal Corps since the war had attended the course.

Some years ago the course had been broadened in extent to incorporate electrical engineering. With the assistance of a newly appointed advisory committee a substantial reorganisation had been planned and this would be put into effect this season. The course would become a four-year "sandwich" course including supervised and paid practical engineering training similar to that in the mechanical engineering course at Bolton Street Technical School in Dublin.

A start had been made in a course of electronics for

electricians, and they intended to provide a course in electronics for engineers, consisting of 20 lectures, which would cater for engineers and scientists.

He said that technical and technological training in their schools followed the same pattern as that of any medium-sized town in England.

In the past ten to fifteen years there had been a rapid expansion of the technical training in Ireland. Staffs had been radically increased at the technological training centres, and further expansion was planned. Most technician courses were evening ones, and covered the usual range of subjects, such as mechanical, electrical and motor engineering, which prepared students for the certificate examination of the Irish Department of Education and the City and Guilds of London Institute.

An important recent development was the extension of the "sandwich" system which consisted of 13 weeks of whole-time work during each of the four years of apprenticeship and a correspondence course conducted by their teaching staffs during a further 30 weeks in each session.

The growth of civil aviation in Ireland and the rapid expansion of the Irish Air Co. had created a demand for training in aeronautical methods.

Technical Training of Women

The shortage of science teachers was alarming in Ireland and would result in the disappearance of graduate teaching of the physical sciences in girls' schools unless urgent steps were taken, said Mrs. C. E. Arregger, in her paper "The Special Problems Connected with the Training of Women and Girls for Scientific, Technological and Technical Work." Ireland needed more scientists, technologists and technicians, and to help to satisfy this demand they should make use of the untapped reserves among girls. It was to the schools that they must look for this for the necessary reorganisation, but this presented many problems.

Married women scientists were keeping things going, but their return to teaching would be helped by the provision of refresher courses. Laboratories and equipment were inadequate in girls' schools, and more teaching of the physical sciences and rather less of biology should be taught.

There still existed many prejudices. Women were now recognised as being inherently capable of becoming scientists but girls were still regarded as having a leaning towards the arts, which might be due to the inadequate and narrowly specialised early science teaching rather than to a born preference. In this age, applied science was pulsating with human problems. Parents should receive more information about scientific careers and the attitude of employers should be more encouraging.

Fifty years ago we had no science laboratories in girls' schools, no women science teachers, no growing body of women scientists and yet tremendous and perhaps unrealised progress had been made. Now we had a foundation on which to build and consolidation was a challenge we must meet.

She suggested that the girls should be taught instruction in general science in the primary schools, and that in the secondary schools more systematic teaching of science should be practised from the earliest forms so that the girls should be interested and would later specialise in science and also so that scientific studies formed a background education for all women in this scientific age.

Too early specialisation should be avoided, and it was strongly recommended that the impossibly high standards of entrance to universities should be modified to give all young people (boys and girls) time for general cultural activities and for studying people and things in the world outside school. Rigid specialisation should only start at university level.

The introduction of a preliminary science course for art students who wished to transfer at first year university level was a very progressive move. University teaching methods could be improved, and curricula could be examined to see if the imputations of overloading were justified. More girls should use the technical colleges in preparation for a technological career, and those who left school at the general certificate of education level should be encouraged to take up further part-time education.

Engineering Apprenticeship System

A review of the British apprenticeship system in the engineering trade was urged by Sir David Anderson in his paper on education and training for the engineering industry. He said that apprenticeship on the Continent was now far more highly developed than our own. Every apprentice must pass a written, oral and practical examination before he became a journeyman. In Britain "serving time" was still the only compulsory requirement and many apprentices became journeymen without having attended a single class or passed a single examination in the whole five years of their apprenticeship.

The Ministry of Labour and National Service and the Advisory Council on Scientific Policy had estimated that the output of engineers should be doubled in the next ten years, but there was no sign of this figure being attained.

There were too many professions chasing too few bodies. Russia, the United States, Western Germany and Britain were producing engineers in the ratio of 4 : 2 : 2 : 1 per unit of the population. This discrepancy was alarming, particularly that in relation to Western Germany because it meant that our competitive power in the European Free Trade Area was going to be taxed to the utmost.

For the education of their technical personnel, the engineering industry looked to the technical colleges and universities. Great developments were taking place in both. In England, an entirely new group of colleges of advanced technology was emerging from among the present major colleges, and these were going to concentrate on full-time sandwich courses. They were to have a new reward, a Diploma in Technology which would rank with a university degree. The output from these colleges might well exceed the output from the universities in the next decade.

A problem much debated at the moment was the place of liberal studies in technological courses. The magnitude of this problem was often exaggerated. Students had never had more opportunities, both as students and in their private lives, for social and cultural contacts. They could not be ignorant of the fact that they lived in a world full of human problems and responsibilities and not in an isolated world of scientifically controlled experiments and results.

We might do a little more, however, to help in such problems; some logic as an aid to clear thinking, some psychology as it bore on our thinking processes and group reactions, and some industrial history would enrich any technological course.

Another criticism levelled at the technological courses was that students were not taught to think but crammed with facts. This criticism was also exaggerated. The fact was that good thinkers were rare; it was an inherent quality of the mind and probably not much influenced by the way syllabuses were presented.

It was true that syllabuses were overcrowded and that there was too little collaboration between university

departments in the running of courses. If there was as little collaboration between university departments in the running of an industrial concern as there was in the average university or major technical college, it would go bankrupt in a year.

Management studies should have a place in all engineering courses, preferably in the form of short residential courses taken at the post-graduate stage. On a short-term basis there was far more scope for improvement in production efficiency from better management than from new industrial techniques.

Thermo-nuclear Energy

In his paper dealing with controlled thermo-nuclear reactions, Sir George Thompson said that in order to get useful energy from heavy hydrogen one must be able to heat it to at least a hundred million degrees centigrade, which was hotter than the centre of the sun. This happened instantaneously in a hydrogen bomb, but for useful purposes the effect must be controlled and made to last for something approaching a second. How was one to prevent the heat escaping prematurely, or indeed faster than it could be fed in so that the hydrogen never really got hot at all?

There were three recognised ways by which heat could be lost—radiation, conduction and convection. Radiation could not be prevented but, though serious, was not bad enough to prevent such a device working. Conduction to the walls of the containing vessel would be quite prohibitive. The problem was to prevent it or at least greatly reduce it. Apparently the only practical method was by magnetic fields which could be generated either inside the gas by very large currents or supplied from outside. In theory, Sir George said, such a containment was impossible, but several likely methods had been suggested.

Convection meant the transfer of heat by the movement of masses of gases or liquids. For example, the shimmering effect of gases or liquids seen on a hot day when the heat was rising was a kind of turbulence. For a thermo-nuclear device to work, this turbulent convection must be stopped. It was not easy to do this. There for the moment the matter rested.

Nuclear Fusion and Power

In his paper "Nuclear Fusion as a Possible Source of Power," Mr. J. D. Lawson said that if they could find, efficiently and economically, a way to convert hydrogen from the oceans of the world into helium, the world's power problems would be solved virtually for all time. Physicists throughout the world were studying the problem, but the experiments carried out so far were not likely to indicate what form the particular type of reactor required might be if and when nuclear fusion became available.

The central problem was not the production of a hot gas, difficult though that might be, but the devising of a system that produced more gas than it consumed. The whole problem was an exciting challenge, demanding the utmost scientific imagination and technical ingenuity.

Several authoritative papers on the fundamental theory had appeared during the past year, although little detailed word of the experimental work or the results achieved had yet been published. There was, however, to be at next year's Geneva Convention on "Atoms for Peace" a session on fusion which would include papers on experimental work.

The problems to be solved must be simply stated. The first was that of isolating a gas almost completely from cool walls, and heating it to a temperature of some hundreds of millions of degrees. Next, some way of utilising the energy produced must be devised either through the conventional heat cycle employed in coal or nuclear power stations or preferably by direct conversion to organised energy; for example, the motion of the charge reaction products might magnify the magnetic fields in such a way as to induce power in some external circuit. Finally, these problems must be solved in such a way that the plant produced more power than it consumed.

The economics of atomic power development in India, and the Indian atomic energy programme were dealt with by Dr. H. J. Bhabha, secretary to the Indian Atomic Energy Department. He devoted a considerable part of the paper to what he described as his own country's modest efforts in atomic research, and then made a plea for the under-developed nations. He pointed out that the development of these under-developed areas of the world would eventually produce enormous demands for power.

If the entire present population of the world were to consume per capita at the same rate as the United States to-day, and allowing for a doubling of the world's population within the next hundred years, which was the least we could expect, the known reserves of fossil fuels in the world would be exhausted in under a century. In this calculation no allowance was made for the rise in the standard of living in the industrially advanced countries which would continue to take place for many decades at a very advanced rate. There seemed little doubt that in due course atomic energy would eventually become the principal source of energy supporting civilisation.

Indian Atomic Development

Dealing with India's atomic energy programme, he said that on the industrial side they intended to produce all the materials required for a full atomic programme. For that reason they had started by setting up a plant at Alwaye, in South India, to treat the well-known monazite sands on the west coast. In addition to producing rare earths and tri-sodium phosphate, a cleaning material sold on the market, this plant produced a cake containing thorium and uranium. This cake was brought to a plant at Trombay, near Bombay, which produces a very pure salt and also a uranium salt. The plant was built by Indian engineers and had been in operation since 1954. Its capacity was increased six-fold last year.

They had designed a small uranium plant which would turn this uranium salt into reactor grade uranium metal, and they expected to have this in operation by the middle of next year. This plant will provide India with enough uranium material for experimental purposes, and for use in the reactors that were at present under construction. It would also give the scientific and technical staff the necessary experience to design and construct the large uranium plants which would be required by a full atomic power programme.

Sir Alexander Fleck, F.R.S., K.B.E., president-elect of the British Association in 1958, when the annual meeting will be held in his native Glasgow, told reporters at a Press conference that he was surprised that more women did not go forward to fill scientific posts. He said that the Association was doing its best to interest women in science.

The original conception of the Association when it was founded in 1831, he said, was that of an organisation interpreting the science then developing to the non-scientific and non-technical intelligentsia. With the penetration of science into the changing life of the community, the Association had had to develop too, and was now an interpreter for the ordinary man in the street.

The Cross-Channel Cable

APPROVAL BY MINISTER OF POWER

THE Minister of Power has now given formal approval in principle to the proposal to provide a high-voltage interconnection between the supply systems of the Central Electricity Authority and of Electricité de France. The connection as now planned will include a 275 kV overhead line between a substation at Canterbury and a terminal point near Dungeness, where a.c. at 275 kV will be converted to d.c. at 200 kV, and transmitted by a single submarine cable between Dungeness and a second convertor station to the east of Boulogne. There the d.c. at 200 kV will be converted to a.c. at 225 kV and a connection made to the French 225 kV system. The nominal transmission capacity will be 160 MW in either direction.

Direct current has been chosen for the connection because it enables the power transfer to be much more easily controlled than would an a.c. connection and is virtually independent of the frequencies of the two systems. In addition, compared with the original a.c. proposals the d.c. connection will be more economic and the single cable is expected to be less prone to faults from external sources than a circuit of three a.c. cables plus a spare cable.

Terminal Stations Plant

The plant for the terminal stations comprises mainly switchgear, transformers and power factor correcting equipment of the conventional type which will be supplied by both countries. The convertor plant is of special design, for which only the Swedish company, ASEA, who successfully constructed the link between the Swedish mainland and the Island of Gotland, have the necessary experience.

The cable for the cross-Channel interconnector will differ from that used in Sweden. The latter contains a single conductor which acts as one pole of the d.c. circuit, the current from the other pole returning via the sea. This cable is laid in an east-west direction. The Channel cable, however, will be laid in a N.W.-S.E. direction and would tend to cause deviation of the magnetic compasses of ships passing over it and along it and might also give rise to corrosion in communication cables laid in the vicinity. To eliminate such risks the cross-Channel cable will employ two insulated conductors to form a "go" and "return" circuit.

The route originally considered for the submarine cable was from a point near Dover to a point between Calais and Cap Gris Nez and although shorter than the route now selected it involved crossing some communication cables at an acute angle and was considered to be more subject to interference from external causes.

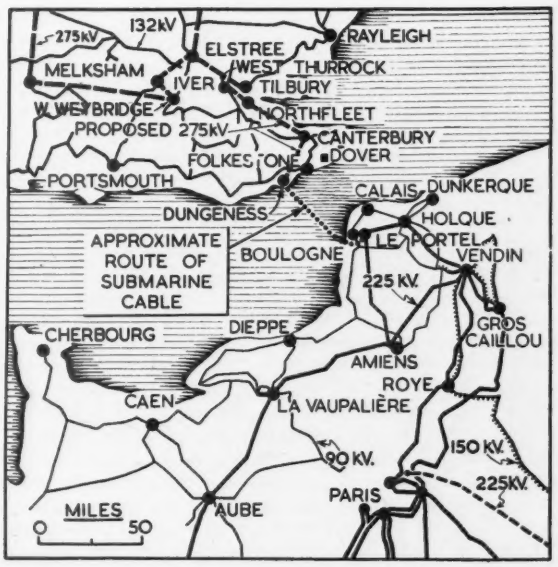
One half of the cable, which will be approximately thirty-five miles long, will be manufactured in Britain and one half in France. Tenders from cable manufacturers in both countries are now being examined. Probably the d.c. system will be so earthed that the cable will operate at 100 kV above and below earth potential.

Whereas the earlier a.c. proposals had envisaged the use of gas-filled paper-insulated cables, the decision to adopt a d.c. scheme with a maximum potential of 100 kV to earth opens up the possibility of using a "solid" paper-insulated cable or a polythene-insulated cable. The latter offers greater simplicity and reduced cost, but the introduction of this new material for high-voltage working will necessitate further experimental work before a firm contract can be placed.

Before final plans can be made, the route settled in detail and work started on site, further consultation will be necessary with other bodies, such as the Post Office and the maritime authorities. It is hoped that the project can be completed in time for the winter load of 1960-61.

The total cost of the scheme to the two countries (excluding the extensions required to the systems to connect them to the link) will be of the order of £4 million. The British portion of the expenditure will be more than offset by the saving obtained from a reduction of the amount of generating plant otherwise required. Similar savings would be effected in France, although their accurate assessment is more difficult because of the mixed character of the hydro-electric and steam electric generation. There would also be savings in operation due to energy exchanges between the two countries, which added to the capital savings are estimated to yield an overall economy of over £300,000 per annum. The Central Electricity Authority regards the whole project as a major experiment with new techniques in the high-voltage, high-power region. Many details remain to be worked out and the economies expected will be largely dependent upon experience with the flexibility and reliability of the connection and with methods of co-ordination as between the control centres of Britain and France. If experience is satisfactory the scheme will provide a basis for extending the capacity of the interconnection and will no doubt stimulate further interest in major submarine connections in other parts of the world.

British and French transmission systems



British Standards Institution

Annual Report for 1956-57

BENEFITS offered to industry through standardisation, simplification and specialisation furnish the keynote of the report of the British Standards Institution for the twelve months ended 31st March last (272 pages; 7s 6d, available from the Institution, British Standards House, 2, Park Street, London, W.1).

Growing appreciation of the value of the work of the Institution is indicated by a further increase in the number of subscribing members (by over 4 per cent), which were drawn from industry and professional associations, the total now exceeding 9,000. During the period under review 287 new and revised British Standards were published, bringing the total number of those current, together with Codes of Practice, to well over 3,000. For the first time more than one million copies of B.S. were sold, about one-quarter of which were sent abroad.

Licences to use B.S.I. certification marks were issued in 1,360 cases, which included for the first time electrically heated blankets, only six of which (tested by the Electrical Development Association) qualified as regards safety, and battery-operated fences. Among applications under investigation were those for mains-operated electric fences, automatic changeover contactors and composite units of switches and fuses.

Alignment of British Standards with international specifications (ISO and I.E.C.) and overseas requirements was the subject of an important statement by the Export Panel (set up in 1954). At the Commonwealth Standards Conference held early this year it was agreed that as far as possible both inch-pound and metric values should be used in the local standards. Reference is made in the main Report to steps taken to encourage the setting up of local standardising organisations in British overseas territories, especially Rhodesia and Nyasaland.

Work was started (in consultation with the International Electrotechnical Commission) on devising recommendations concerning nuclear energy. This is to cover terminology, safety from radiations and safe and effective operation of reactors. In conjunction with the International Organisation of Standardisation activities were initiated in regard to measuring instruments for reactors, the use of radio-isotopes, and components for servo-mechanics.

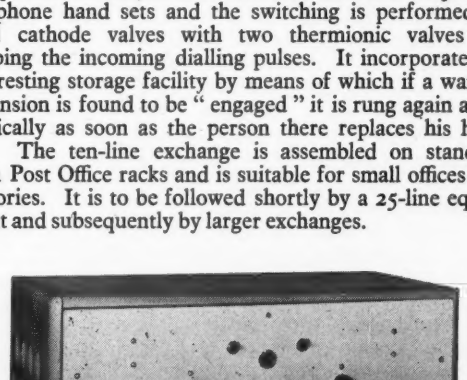
Under the heading of "Electrical Engineering" reference is made to the reconciliation of unavoidable differences in Commonwealth specifications owing to divergencies in applications, conditions of use and climate. Thus while limits due to temperature rise vary with normal temperatures, the adoption of the same top temperatures should be feasible. Commonwealth standards for rubber-insulated cables differ in relation to composition of rubber; this is specified in some countries, whereas in others reliance is placed on tests alone. Among numerous other electrical features of the report it is announced that a revision of B.S.562 will enable the rating of connectors for portable domestic appliances to be increased from 7½ to 10 A, while a new design of connector for appliances that generate heat (e.g. kettles) will have an unexposed earthing contact. A specification for semi-enclosed rewirable fuses up to 660 V is in preparation. Foot- and flange-mounted ventilated motors up to 50 h.p. and 3,000 r.p.m., using Class E insulation with a permissible temperature rise of 65 deg C, will be covered by a new standard on dimensions. Specifications for silicon and germanium power rectifiers are being prepared. Proposals for revising the B.S. covering intrinsically safe electrical equipment are to be considered by the I.E.C.

Although the income of the Institution, £132,000, was considerably higher than in the previous year, the accounts show a deficit for the first time for many years owing to increases in printing costs and higher salaries and wages.

Progress in Communications

AN exhibition was held in London last week to illustrate the progress which has been made by Pye Telecommunications, Ltd., since it first began operations in Cambridge ten years ago. The exhibits ranged from a historical display of the company's early radio telephones to the latest types of equipment being manufactured. For example, there was a radio telephone system operating on a 12½ kc/s channel spacing, micro-wave equipment for television and communication links with cameras relaying from Trafalgar Square to the exhibition. There was also an interesting display of apparatus incorporating transistors.

Perhaps the most outstanding product on view was the electronic telephone exchange. So far as is known the company is the first organisation in the world to market an electronic telephone exchange for commercial use. The example shown at the exhibition was a 10-line private automatic exchange measuring only 20in by 19in by 12in. It operates in conjunction with standard G.P.O. pattern telephone hand sets and the switching is performed by cold cathode valves with two thermionic valves for shaping the incoming dialling pulses. It incorporates an interesting storage facility by means of which if a wanted extension is found to be "engaged" it is rung again automatically as soon as the person there replaces his hand set. The ten-line exchange is assembled on standard 17in Post Office racks and is suitable for small offices and factories. It is to be followed shortly by a 25-line equipment and subsequently by larger exchanges.



Pye 10-line electronic telephone exchange

VIEWS on the NEWS

By REFLECTOR

MY correspondent who specialises in odd facts about electricity says that it was 200 years ago that the terms "positive" and "negative" were first actually used although the idea had been around for over forty years. In 1733 Charles Dufray a brilliant ex-soldier scientist at the French Court proclaimed his idea of two distinct electricities—"vitreous" and "resinous." The theory was primitive but it was followed in 1747 by the correct basic principle advanced by Benjamin Franklin who considered "vitreous" electricity to be electricity itself—the single fluid—and "resinous" as the lack of such fluid. So Franklin termed these "plus" and "minus" without having any knowledge at the time of Dufray's awkward theory or terminology. Franklin advanced his considered and "proved" theory in a letter to Peter Collinson, F.R.S., London, dated 11th July, 1747, and so the terms "positive" and "negative" first came to England. It was Collinson who first used the conventional signs in a letter of 18th September, 1757. Collinson was more a botanist than an electrical scientist but it was he who kept Franklin posted with all the Continental advances in the study of electricity.

* * *

Instances are too often reported of manufacturers' apparent ignorance of some overseas markets—particularly Latin-American countries. *Intercambio,* the journal of the British Chamber of Commerce in Mexico, quotes a couple of cases in its July issue. The first is as follows:

> "A British firm manufacturing pipe bending machines (for which, apparently, there would be a market here if sales were handled in a commonsense way), when approached by one of our members for quotations, replied that sales in Mexico were handled by an organisation in Paris. . . . The quotations from the French concern were quite uncompetitive, and the result was that our member's summing up of the situation (to the British manufacturer) was on the outspoken side. . . . There may well be some extenuating circumstances about which we are ignorant but, in general, if a British firm wants to enter a market such as Mexico's with its products it should realise that . . . competition is likely to be such that the direct manufacturer-importer relationship . . . is pretty well essential."

The other instance related to an inquiry by a Mexican firm of printing machinery and machine tool distributors who were referred by British manufacturers to a firm in Argentina "who represented them in South America," a reply not calculated to lead to business in view of the national pride of these countries.

* * *

"Cablehangers" would suggest either cable racks or catenaries. It is, however, a term which was once applied at Whitstable, Kent, to oyster poachers (according to the *Manchester Guardian*). It is not explained why, but it is possible that the cables were those attached to the dredges used for collecting the oysters. Anyhow, cablehangers, if caught, were liable to seven years' transportation, a penalty which, of course, some awkward people would like to see imposed on the latter-day cablehangers—overhead line erectors.

* * *

A report in the *Manchester Evening News* reveals an unusual defence in a case of electricity theft. The accused put the blame on a budgerigar which, he said, had taken the seal off the main fuse and pecked the covering from the leads. So the accused pushed the wire in to avoid having an uncovered section; that gave him the idea of by-passing the meter.

* * *

According to the *Daily Mail,* housewives who telephoned the Eastern Electricity Board when a power failure occurred in parts of Middlesex on a recent Sunday were told "You ladies having been doing too much cooking. All this cooking has been too much for the service and has blown the main fuse." I hope this tactless remark does not cost the Board its position as one of the leading supply authorities in the development of electric cooking.

* * *

Brussels, where next year's International Exhibition is rapidly taking shape, boasts a fine modern electric railway system linking the Belgian capital with most of the main towns. It also has one of the older forms of electric traction in its network of tramways which, if less comfortable, still provide an efficient service. They date back at least sixty years for, in the *Electrical Review* of 17th September, 1897, I came across a description of the system by E. Kilburn Scott, of which the following are extracts:—

> "One of the electric routes runs around the Boulevards from the Gare du Midi to the Gare du Nord and the other from the city right out to the country. A good deal of double track is on one side of the street, with the inner rail close to the kerb and, where this is the case, tubular poles on one side only, with single bracket arms about 15ft long, carry the two trolley wires.
>
> "Each motor car is fitted with two G.E. 800 25 h.p. motors which give a total horizontal effort of 1,600 lb on the 33in car wheel when running at 8 m.p.h. Each motor car is fitted with the well-known Thomson-Houston magnet blow-out K^2 controller at each end and when empty it weighs 6¼ tons and draws an open trailer car weighing 2 tons."

The article goes on to say that the minimum fares were 1½d a mile first class and 1d second class, a four-mile run costing 3d first-class and 2½d second-class. The operation of the system was said to be singularly free from interruption, with the qualification: "Accidents, when they do occur, are motor burn-outs, or broken axles, and sometimes a specimen of misplaced humanity may be shovelled into the safety fender."

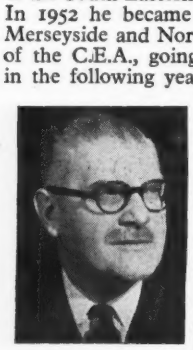
PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Minister of Power has appointed **Mr. W. A. Gallon,** B.Sc., M.I.E.E., F.R.Econ.S., M.Inst.F., to be chairman of the South Wales Electricity Board in succession to the late Mr. L. Howles. **Mr. H. Pryce-Jones,** J.P., M.Eng., M.I.C.E., M.I.E.E., succeeds Mr. Gallon as deputy chairman of the Board. **Mr. R. James,** O.B.E., Wh.Sc., D.I.C., M.I.Mech.E., A.R.C.S., of Treforest, has been reappointed as a part-time member of the Board.

Mr. Gallon, who has been deputy chairman of the Board since 1953, was educated at Rutherford College, Newcastle-on-Tyne, and after service in the 1914-18 war he resumed his studies at Armstrong College and Durham University, following which he was for seven years technical assistant in the testing department of the Newcastle Electric Supply Co. In 1928 he became senior assistant electrical engineer to Imperial Chemical Industries, Ltd., Billingham-on-Tees, leaving this company in 1935 to become deputy borough electrical engineer to the Plymouth Corporation. He went to Southampton as assistant borough electrical engineer in 1938 and was appointed borough electrical engineer at Woolwich in 1941, which position he held until nationalisation in 1948 when he was appointed chief engineer of the South Eastern Electricity Board. In 1952 he became controller of the Merseyside and North Wales Division of the C.E.A., going to South Wales in the following year. Mr. Gallon is a past-chairman of the Tees-Side Sub-Centre of the Institution of Electrical Engineers.

Mr. W. A. Gallon

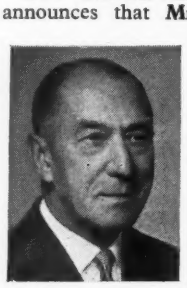


Mr. H. Pryce-Jones

Mr. Pryce-Jones received his technical training at the Manchester College of Technology and the University of Liverpool. He obtained his workshop training with the British Westinghouse and Metropolitan-Vickers Electrical Co., at Trafford Park, afterwards becoming an assistant in the electrical machine testing department and later an engineering assistant in the general engineering department, mining section. After some sea-going experience as a marine engineer in the Merchant Navy, Mr. Pryce-Jones joined the Liverpool Corporation Electricity Department in 1928 as an engineering assistant, later becoming successively technical assistant, chief technical assistant, and deputy city electrical engineer, and while at Liverpool he was part-time lecturer in electrical engineering at the Birkenhead Technical College. He went to Brighton in 1943 as chief engineer and manager of the Brighton Corporation Electricity Department, a position he held until 1948 when he was appointed manager of the South Eastern Electricity Board's Mid-Sussex Sub-Area. Among his many activities he was chairman of the Mersey and North Wales Centre of the Institution of Electrical Engineers in 1942-43, president of the Liverpool Engineering Society in 1942-43 and national president of the Association of Public Lighting Engineers in 1951-52.

Mr. J. E. Macfarlane has been appointed Acting Principal of the Liverpool College of Technology until a new principal is appointed.

The General Electric Co., Ltd., announces that **Mr. F. Winstanley,** a director of the company since 1929, has resigned from the board. He will continue to fulfil his managerial responsibilities, which cover the lighting fittings, domestic equipment, and household appliances departments, until the end of the current financial year, when he will have completed sixty years' service with the company.



Mr. F. Winstanley

Mr. Winstanley joined the Manchester branch of the company in 1898 at the age of fourteen. In 1907 he was appointed manager of the Lighting Fittings Department in Manchester. He moved to the head office in London in 1919 as manager of the Lighting Fittings Department, and in 1926 he became manager of the Domestic Equipment and Household Appliances Departments. He remains a director of the Oriental Tube Co., the Steel Conduit Co., and Claude-General Neon Lights, Ltd. Mr. Winstanley is well known throughout the electrical trade both at home and abroad, and has served on many trade associations and committees. He has served as B.E.A.M.A. representative on the Industrial Art Committee of the F.B.I., and is a governor of the L.C.C. Central School of Arts and Crafts. He is Master of the Worshipful Company of Glaziers for the current year.

Mr. D. R. Barrett has been appointed sales manager of Kent Bros. Electric Wire Co. & E. H. Phillips, Ltd., in succession to **Mr. V. H. C. Phillips,** whose appointment as assistant general manager was announced recently. Mr. Barrett has been a sales representative of the company since 1946.

Mr. D. Hall, A.Met., F.I.M., has joined Low Moor Alloy Steelworks, Ltd., and Yorkshire Rolling Mills, Ltd., as general works manager.

Mr. H. McNeil, B.E., M.I.Mech.E., M.I.E.E., has been elected to succeed **Mr. J. R. Rylands** as president of the Institute of Fuel in October next. Mr. McNeil was born in New Zealand in 1904 and was educated at Canterbury University College, Christchurch, where he took the degree of B.E. of the University of New Zealand, in electrical engineering. He received his practical training with the Public Works Department in New Zealand in conjunction with his university course.

Mr. H. McNeil

Appointed an assistant engineer by the State Electricity Commission of Victoria, Australia, in 1929, he was engaged in their Brown Coal Briquetting Department, his career from that time being closely concerned with fuel technology. He joined Babcock & Wilcox, Ltd., in London in 1931 as a service engineer and was appointed engineer in charge of peat briquetting in 1935, deputy chief engineer (1938) and general manager (1947), becoming a director of the company in 1950 and in 1953 being appointed deputy managing director. He is also a director of Dewrance & Co., Ltd., and of the German, Spanish and Australian Babcock & Wilcox companies.

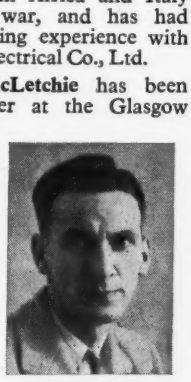
Mr. McNeil was in 1938 the joint author with the late Mr. E. L. Luly of a paper published in the *Journal* of the Institute of Fuel on "The Harvesting and Briquetting of Peat." He has been a member of Council of the Institute since 1953 and served as a vice-president from 1953 to 1956; he

is now chairman of its Finance and General Purposes Committee. He will take the chair as president on the occasion of the Institute's annual dinner and dance to be held at Grosvenor House, Park Lane, W.1, on 22nd October.

Mr. R. L. C. Tate, F.R.S.A., has left the staff of the A.E.I. Lamp & Lighting Co., Ltd., where he was field engineer for shops and stores, in order to join Harris & Sheldon (Electrical), Ltd., in a similar capacity. Well known as a lecturer when on the staff of the E.L.M.A. Lighting Service Bureau, Mr. Tate is a recognised authority on shop and store lighting and has done pioneer work on the most suitable colour-combinations of filament and fluorescent lamps for display lighting. In 1954 he read a paper on shop lighting before the Illuminating Engineering Society and he has taken an active part in a number of conferences. Educated at Christ's Hospital, he served with the R.E.M.E. in North Africa and Italy during the last war, and has had electrical contracting experience with Abell & Smiths Electrical Co., Ltd.

Mr. R. L. C. Tate

Mr. A. B. McLetchie has been appointed manager at the Glasgow branch of the Stearn Electric Co., Ltd. Before this appointment Mr. McLetchie was employed by James Scott & Co., Electrical Engineers, Glasgow, Ltd.



Mr. A. B. McLetchie

In April of this year the British Transport Commission announced that it had accepted a plan of reorganisation following a review of the organisation of the supplies side of its business. The new organisation involves the establishment of a separate Contracts Branch at Headquarters and **Mr. S. C. Robbins,** at present an Under Secretary of the Ministry of Supply, has been appointed chief contracts officer.

Mr. H. J. Lobley, of Walton Road, Liverpool, who saved a colleague from being electrocuted, was presented with the Queen's Commendation for Brave Conduct at a ceremony at Knowsley Hall, Prescot, Lancs., on 6th September. Mr. Lobley, a labourer, was helping Mr. J. Seddon, senior charge electrician at the power station at the works of Tate & Lyle, Ltd., Liverpool, to install electrical equipment when a "short" occurred. Lobley received a shock and a small fire started. Seddon tried to put it out and his hands came into contact with a live part of the apparatus. The citation states: "With great presence of mind and with considerable bravery, especially considering he had just been affected by shock himself, Lobley took prompt action and charged Seddon with his shoulder out of contact. Seddon fell to the ground, recovered immediately, and put out the remainder of the fire." The award was presented by the Earl of Derby.

The South Western Electricity Board has appointed **Mr. G. W. Richards** to be manager of its Bristol Sub-Area, with responsibility for electricity supply in the city and over a large area of North Somerset including Bath and Weston-super-Mare. Mr. Richards succeeds **Mr. E. C. Willis,** who is now the deputy chairman of the Board.

Mr. G. W. Richards

Mr. Richards has been deputy manager for the Bristol Sub-Area since 1949, and has been in the electrical industry for forty-three years. His early training as a pupil apprentice in mechanical engineering was followed, in 1914, by a year with the Urban Electric Supply Co. in Cornwall. After service in the 1914-18 war he joined the Cornwall Electric Power Co. in 1918, with which he became commercial manager and deputy to the general manager in 1943, a position he held until nationalisation in 1948 when he was appointed deputy chief commercial officer of the South Western Electricity Board.

Mr. R. J. Milburn, manager of the Burnley factory of Joseph Lucas (Electrical), Ltd., has been appointed manager of the company's Australian factories. He will hand over to his successor, **Col. W. H. Bush,** manager of the Staffordshire factory for the last two years, in about one month's time and before leaving for Australia in January will visit the company's other United Kingdom works. Mr. Milburn has been with Joseph Lucas since 1939.

While retaining an active interest in the service of the Belmos Co., Ltd., **Mr. R. T. Lythall** has resigned his seat on the board in order that he may devote more time to certain special activities concerned with the associated company, Everett Edgcumbe & Co., Ltd., of which he has recently been appointed a director. Apart from the special work assigned to him, Mr. Lythall will represent the interests of both the Belmos Co. and Everett Edgcumbe in the counties of Hampshire, Gloucestershire, Somerset, Dorset, Wiltshire, Devon and Cornwall. The London office of the Belmos Co., previously the concern of Mr. Lythall, is now under the control of **Mr. G. W. Wilson,** M.B.E., who is also a director of the company.

The **Trix Electrical Co., Ltd.,** entertained over 250 friends of the trade and Press to cocktails at the May Fair Hotel, London, on 28th August. Besides being its annual reception and display, this was also a celebration of the company's thirtieth anniversary. Mr. R. Arbib (chairman of the R.E.C.M.F.) proposed a toast to the company and its future prosperity and Mr. D. A. Lyons, managing director of the Trix Electrical Co., proposed the health of the guests. Mr. Lyons was then presented with a gold and silver cigarette case on behalf of his co-directors and staff, to mark the occasion.

Mr. G. N. Petty has joined the Brush Export Organisation as area director for the Far East and Australasia. Mr. Petty was previously with D. Napier & Son, Ltd., where he was export sales manager. He has also worked for the diesel and export divisions of the English Electric Co., Ltd.

At last Tuesday's luncheon of the **Electrical Industries Club** Mr. Norman Boydell (South Eastern Electricity Board) was the guest-speaker and his subject was hobbies. Emphasising the "therapeutic" value to men of all ages, but particularly to the retired, of having some form of recreation, Mr. Boydell described the remarkable assembly of models which he has constructed at his Eastbourne home. The speaker was introduced by the president, Mr. A. F. Plummer, and a vote of thanks was moved by Mr. S. H. Robinson, seconded by Mr. C. Hughes. Mr. Plummer announced that the speaker at the next luncheon (8th October) would be Sir Hugh Beaver.

OBITUARY

Dr. R. W. Bailey.—The death occurred on 4th September of Dr. R. W. Bailey, who retired from active duties as consultant to the Metropolitan-Vickers Electrical Co.'s Research Department on 31st March this year.

The late Dr. R. W. Bailey

After serving his apprenticeship at the Great Eastern Railway Co.'s Locomotive Works, Stratford, and taking an electrical engineering course at the City and Guilds Central Technical College, London, Dr. Bailey first joined the Metropolitan-Vickers Co. (then British Westinghouse) as a college apprentice in 1907. Making a

temporary break with industry, he then became a lecturer in mechanical engineering at the Battersea Polytechnic, London, and in 1912 was appointed the first Principal of the Crewe Technical Institute (now Technical College). In 1919 he returned to the Metropolitan-Vickers Co. and took charge of the Research Department laboratory concerned with chemical, mechanical and metallurgical testing. He relinquished executive duties in 1945 to give more attention to special research and development work and to act as consulting research engineer.

Dr. Bailey held some eighty-eight British patents and was the author of thirty-five published papers. For his published work relating to the principles of design, behaviour and properties of metals at elevated temperatures, he was awarded the degree of D.Sc.(Eng.) by London University in 1936. He was also awarded the Thomas Hawksley Premium in 1929 and the Thomas Hawksley Gold Medal in 1935 by the Institution of Mechanical Engineers, of which he was elected president in 1954. In 1950 he was made an honorary associate of the Manchester College of Technology. In the previous year he had been elected a Fellow of the Royal Society, and he served on the Society's Council during 1951-52.

Dr. Bailey served on very many technical committees, and was particularly well known for his contributions to the work of committees of the British Standards Institution, the Institution of Mechanical Engineers, and the British Electrical and Allied Industries Research Association.

Mr. George Simpson Butler, for over thirty years a well-known manufacturers' agent throughout the electrical trade in Lancashire and many parts of Ireland, died at his home in Ainsdale on 31st August at the age of fifty-six.

Mr. C. G. Rogers.—The death occurred on 5th September of Mr. Charles Rogers, a well-known member of the lamp sales force of the A.E.I. Lamp & Lighting Co.; he was sixty-two. Mr. Rogers, after service in the R.E. Signals during the 1914-18 war, joined the British Thomson-Houston Co. in London. Later he transferred to Bristol and became manager, lamp sales, when the Bristol branch was formed in 1924. He returned to London in 1940 as assistant manager, lamp sales, southern area, B.T.H. Co., and for the last ten years had been engaged on special duties in the London area. Mr. Rogers was a founder-member and a past-president of the Bristol Electric Club.

Mr. Brudenell Plummer Boyle, M.I.E.E., died on 7th September at Beare Green, Surrey.

Mr. D. McR. Massie.—The death is reported of Mr. Duncan McRobert Massie, deputy chairman of Donald Macpherson & Co., Ltd., of Mitcham, which occurred on 5th September at the age of fifty-one.

SPECIAL LIGHTING ISSUE

Next week's *Electrical Review* will deal particularly with lighting developments. In addition to articles on public lighting, with a review of the A.P.L.E. Exhibition and Conference papers, the issue will include special contributions on lighting in schools and machine shops

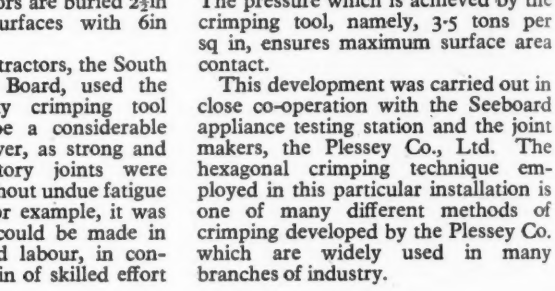
Crimping Technique

An interesting innovation in the installation of an extensive electrical floor warming system at the new factory of Morphy-Richards, Ltd., at St. Mary Cray, Kent, is the use of cold compression joints in the heating conductors and at their junction with the power feeds. The system employed is the now well-known solidly embedded mineral-insulated copper sheathed conductor supplied by Pyrotenax, Ltd. Nearly thirty miles of cable is used in the installation, which extends beneath 66,300 sq ft of floor space; conductors are buried 2½in below the floor surfaces with 6in spacing.

The electrical contractors, the South Eastern Electricity Board, used the Plessey heavy duty crimping tool which proved to be a considerable time and money saver, as strong and completely satisfactory joints were obtained quickly without undue fatigue to the operator. For example, it was found that a joint could be made in 10 min by unskilled labour, in contrast to the 40-50 min of skilled effort for a soldered joint. The measure of the total saving will be appreciated when it is known that some 750 joints were necessary.

The close tolerances maintained on terminations and crimping dies ensure that the joint becomes a homogeneous mass resulting in high electrical conductivity and mechanical strength. In addition, full flexibility of the cable is assured up to the point where it terminates, and the attendant problems of heat and corrosion often experienced with soldering are eliminated. The pressure which is achieved by the crimping tool, namely, 3·5 tons per sq in, ensures maximum surface area contact.

This development was carried out in close co-operation with the Seeboard appliance testing station and the joint makers, the Plessey Co., Ltd. The hexagonal crimping technique employed in this particular installation is one of many different methods of crimping developed by the Plessey Co. which are widely used in many branches of industry.



Plessey crimped joint and method of assembly before crimping

WILLS

Mr. H. C. Gray, A.M.I.E.E., formerly of the Post Office Engineering Department and the National Telephone Co., who died on 19th March last, left £4,541 gross (£4,463 net).

Sir James Donald, C.S.I., C.I.E., for some time chairman of the Calcutta Electric Supply Corporation, Ltd., who died on 26th April last, left £12,914 gross (£12,704 net).

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £197 0s 0d
COPPER, H.C. Electro	ton £183 5s 0d
Fire Refined 99·70%	ton £182 0s 0d
Fire Refined 99·50%	ton £181 0s 0d
COPPER Tubes ..	lb 1s 9½d
Sheet	ton £208 0s 0d
H.C. wire and strip ..	ton £241 15s 0d
LEAD, English ..	ton £90 5s 0d
Foreign	ton £89 0s 0d
MERCURY	flask £87 0s 0d
TIN, block (English) ..	ton £737 5s 0d
ZINC, G.O.B. Foreign	ton £73 10s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 6½d
Sheet	ton —
Wire	lb 2s 3½d
PHOSPHOR BRONZE Wire	lb 3s 6½d
PLATINUM	oz £31 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 26½d—26½d

INDUSTRIAL NEWS

Census of Production

The Census of Production for 1958 will be the first detailed census since 1954. Changes which are being made should, however, enable the census forms to be completed more easily and returned more quickly. Less information will be asked for than for 1954, and full particulars will be required only from firms employing twenty-five or more persons, instead of from those employing more than ten persons on productive work. For 1958, full returns will be made for only about 50,000 industrial establishments, compared with about 71,000 in the 1954 Census. Of the smaller firms, only 17,000 instead of 107,000 will be asked questions about their sales; and 86,000 will be relieved of any obligation to complete census returns. Further explanation can be obtained from the Board of Trade. Inquiries should be addressed to the Census Office, Lime Grove, Eastcote, Ruislip, Middx. (telephone: Pinner 9800, Extn. 28).

New Brush Company

The Brush Group, Ltd., has formed a subsidiary company, National Free Piston Power, Ltd., for marketing at home and overseas free piston gasifiers, manufactured by the National Gas & Oil Engine Co., Ltd., under Pescara/SEME/Muntz licence. Mr. D. Robson, formerly of Alan Muntz, has been appointed executive director of the new company in which capacity he will be responsible to Mr. B. R. Cant, general manager of the National Gas & Oil Engine Co. Other directors are Mr. I. T. Morrow, chairman (managing director of the Brush Group), Mr. C. F. Barnard and Mr. F. Warhurst.

E.A.W. Activities

A one-day conference on "The Teaching of Electrical Housecraft" will be held by the Electrical Association for Women on 19th October at the Glasgow and West of Scotland College of Domestic Science, 1, Park Drive, Glasgow, C.3. Applications to attend should be made to the Association at 25, Foubert's Place, London, W.1.

The Association's Certificate in Electrical Housecraft was awarded to fifty teachers and 134 demonstrators on the results of the examinations held in June. The totals now holding this certificate are 2,161 teachers and 2,720 demonstrators.

Electrician Killed

A 37-year-old electrician doing an odd job outside his working hours "unfortunately took the wrong precautions" and was electrocuted, the Birmingham city coroner, Mr. George Billington, said on Friday. He recorded a verdict of "Accidental death" on Thomas Douglas Harris, King's Heath, Birmingham, who died on 3rd September.

Mr. H. Fitter, of the Midlands Electricity Board, said that Harris was going to install two light points and two sockets. He had also to remove a switch which was suspended from a conduit. Two fuses were taken out to isolate the circuit, but the pair of fuses removed were the wrong ones. The pair he should have removed were not in that particular fuse box at all.

Radio Sets to be Made in Ceylon

Our Colombo correspondent reports that a Hungarian company is to assist a Ceylon firm to set up a factory to make radio sets and radiogramophones in Ceylon. The local firm states that it is prepared to meet all local requirements for three years. The components will initially be imported from abroad. In a memorandum to the Minister of Industries asking what protection the Government will afford the Ceylon firm says that 46,786 radio sets, excluding radiograms, are at present imported into Ceylon annually.

World Oil Production

Oil production and refining centres throughout the world, with statistics for 1956, are indicated on the 1957 edition of the P.I.B. wall map. Copies of this map are now available, price 2s post free, from the Petroleum Information Bureau, 29, New Bond Street, London, W.1.

Rubber Production and Consumption

During the first half of this year, reports the Secretariat of the International Rubber Study Group (Brettenham House, Lancaster Place, London, W.C.2), the production of natural rubber amounted to 872,500 long tons while consumption totalled 950,000 tons. Stocks at the end of June were 800,000 tons, a decline of 60,000 tons since 1st January.

Synthetic rubber production during the same period totalled 605,000 tons and consumption 630,000 tons. Stocks at the end of June were 30,000 tons lower at 237,500 tons.

Generating Equipment for Iraq

The Metropolitan-Vickers Electrical Export Co., Ltd., has received a contract for power generating equipment from the Government of Iraq (Development Board and Ministry of Development). The order, valued at £686,000, is for three 15 MW steam turbo-generator sets and associated steam condensers, auxiliaries and spares. The equipment will be installed in a new power station to be built at Basrah, the port of Iraq on the Persian Gulf. The project is part of a 10-year Development Plan; two other thermal power stations at Baghdad (Central Iraq) and Dibis (Northern Iraq) are already under construction, and their interconnection with the Basrah station will form the basis of an all-Iraqi grid supplying both industrial and irrigation (pumping) centres. Later, hydro-electric plant on barrages across the Tigris and the Euphrates will also be connected to the system. The Basrah plant will generate at 11 kV 0·8 power factor, operating with steam conditions of 600 p.s.i.g. 750 deg F, and interconnection with the Baghdad and Dibis stations will be by a 132 kV overhead transmission line.

Lamp Publicity

A wide variety of Mazda display material will be available from the A.E.I. Lamp & Lighting Co., Ltd., for the autumn lamp sales campaign including window dressing centre pieces, both still and animated, counter showcards and a free standing merchandising unit and lamp display.

In most cases display material features either actual lamps or a lamp pack. All new displays include the slogan "Mazda lamps stay brighter longer." A striking three shelf merchandising unit is available made to a design which proved successful during a recent test campaign in the Manchester area. It occupies only a small floor area and holds a gross of assorted lamps. Construction is in corrugated fibre board, and printing is in yellow, black and red, with an illustration of a woman sewing, and the slogan "Ask for a Mazda 100 W for brighter light." Its dimensions are

Mazda lamp merchandising floor unit

46in high (plus 16in crowner), 25in wide and 8½in deep. The unit is designed to stand by itself or to fit the front of a sales counter. "Don't be a lamp snatcher" is the theme chosen for a range of displays including a 40in by 30in decorative window centre piece featuring 100 W pearl, silverlight and pearl pink lamps. There are three smaller counter display cards on the same theme. All carry the advice "Take home some spare Mazda lamps now." In addition to general display material there is a comprehensive range of posters, leaflet dispensers and window dressing centre pieces supporting the Mazda Queen of Light Competition which is being held in fifty centres throughout the country, culminating in the National Final in London, in December.

Advertising in Bulk

Philips Electrical, Ltd., in conjunction with the *Evening Standard* made advertising history on 31st August when every displayed advertisement in the entire issue (all editions) featured one or other of Philips consumer products.

Film Guide

A useful booklet entitled "The Year's 16 mm Films, 1956," has been published by Current Affairs, Ltd. This contains brief reviews from the *Film User* of 16 mm films released in 1956. The reviews are arranged in three groups—factual films, entertainment features and entertainment "shorts." A subject index of factual films facilitates reference, and there is also a title index. The book is obtainable from *Film User*, 319, High Holborn, London, W.C.1, price 8s 6d net (8s 9d post-free).

Factory Lighting

The Newcastle-upon-Tyne office of the Lighting Service Bureau has arranged an evening's talk and discussion on "Factory Lighting" at five towns in the north. The new E.D.A. film "New Light on Industry" will be shown together with coloured illustrations and demonstrations relating to the subject. The meetings are as follows: — Middlesbrough, 23rd September; Newcastle - upon - Tyne, 24th September; Carlisle, 25th September; Sunderland, 26th September; and Darlington, 27th September. Applications for seats and for further information should be made to the Bureau, Northgate House, St. Mary's Place East, Newcastle-upon-Tyne, 1.

Welding Agreement

Electrodes and seam welding wheels in Hidurel 6 chromium copper alloy are now being manufactured and distributed by Davis & Timmins, Ltd., who have a sole and exclusive franchise from Langley Alloys, Ltd., for this purpose. Sale of bar material and wheel blanks is also covered by the agreement to assist users who make their own electrodes or require non-standard types. Electrodes are stocked in various sizes and types, to conform with British Standard Specification 807, and wheels in a wide range of diameters and thicknesses.

Reactor Manufacture in Belgium

Two Belgian firms, the Ateliers de Constructions Electriques de Charleroi and the S.A. Cockerill-Ougrée ironworks have signed a licence agreement with the Westinghouse Electric International Company, which will permit them to manufacture and sell all the non-military types of reactors developed by the American company. The agreement is valid for fifteen years.

North West Clean Air Campaign

A clean air campaign in South East Lancashire and Cheshire was inaugurated at the Free Trade Hall, Manchester, on 3rd September by Lord Mills, Minister of Power. The Lord Mayor of Manchester presided at the opening ceremony which was preceded by a luncheon at the Town Hall. Those exhibiting included the Solid Smokeless Fuels Federation, the North Western Electricity Board, the Department of Scientific and Industrial Research and the National Smoke Abatement Society. A similar exhibition has been held this week at Bolton and others arranged will be in Bury, Oldham, Rochdale, St. Helens, Salford, Stockport, Warrington and Wigan.

Electrical Commercial Travellers

A general meeting of the Electrical Trades' Commercial Travellers' Association will be held this evening (Friday) at 6.30 p.m. at the Feathers Hotel, Broadway, Westminster, London, S.W.1. The Association's annual ball will be held on 4th October at the Park Lane Hotel, Piccadilly, W.1. Tickets (45s each) can be obtained from Mr. A. J. Murray, c/o British Electric Lamps, Ltd., 229, Westminster Bridge Road, London, S.E.1.

Industrial Efficiency and Productivity Exhibition

Sir Charles Garonne Renold, J.P., M.E., chairman of Renold Chains, Ltd., will perform the opening ceremony at the Industrial Efficiency and Productivity Exhibition which will be held at the City Hall, Deansgate, Manchester, from 5th to 16th November.

Thorn's in Australia

The announcement last week by the State Premier, Mr. H. Bolte, in Melbourne that Thorn Electrical Industries, Ltd., plans to invest more than £A2,000,000 on a development project in Victoria, marks a further stage in a scheme designed eventually to provide production facilities in Australia for the complete range of Thorn products. No date has yet been fixed for the commencement of building operations on a five-acre site at Heidelberg but the cost of the first factory wing will exceed £A250,000. For the past three years incandescent lamps have been manufactured in Australia by Thorn's subsidiary, Thorn Electrical Industries (Australia) Pty., Ltd., and more recently production was commenced on the manufacture of television receivers. Plans are in hand for the manufacture and marketing of radio receivers and, as facilities become available, the other principal products of the Thorn group.

Liverpool Lighting Conversion

Mr. C. C. Smith, M.I.E.E., F.I.E.S., city lighting engineer, Liverpool, in his annual report states that the most important task facing his department is that of the completion, as soon as possible, of the electrification scheme. This is scheduled to take ten to fifteen years and to cost approximately £600,000. In the first two years 1,328 gas lamps have been replaced by 2,181 electric, at a cost of £84,595, and next year, the third of the scheme, it is planned to replace a further 670 gas lamps by 1,000 electric lamps.

In Liverpool there are at present in commission 26,649 electric and 10,014 gas lamps. The number of lamps now operated by remote or centralised control from 75 control points is 5,799.

Use of metal filament lamps during the year to 31st March last averaged 4·58 per holder per annum and sodium lamps 1·29. Gas mantle use averaged 4·13 per burner per annum. This heavy consumption is due in a large measure to the extensive breakage of glass in street lamps.

Land and Submarine Cables for Northern Ireland

A contract worth £36,000 covering the supply and laying of two 33 kV submarine and land cables each approximately 2,000 yd in length has been placed with Siemens Edison Swan, Ltd., by the Electricity Board for Northern Ireland. The cables which are 0·3 sq in, 3-core paper insulated h.s.l. type are to form a double circuit from Ballylumford power station to Larne substation on the opposite side of Larne Lough. The submarine sections of the cable will each be made in one continuous length without factory or submarine joints. They will be loaded from the factory wharf at Woolwich into the laying vessel. The cables are to be laid direct on the Larne Lough bed, 100ft apart, and dredged in trenches for a distance of approximately 100 yd on each shore below low water line. Messrs. Kennedy & Donkin are the consulting engineers for this contract.

Transistor Manufacture

Semiconductors, Ltd., announces the construction of a specially designed factory on the Cheney Manor Estate, Swindon, solely for the production of transistors. Special air-conditioning equipment will regulate temperature,

humidity and dust concentration in the main production areas, to ensure that the manufactured transistors will be free from impurities. Production at the new factory is expected to start during 1958 with the manufacture of the high frequency surface barrier and micro-alloy types of transistors for military and other specialist applications currently made by the Lansdale Tube Co., U.S.A. Other types of transistors to be made will include silicon alloy types for high frequency operation over a wide range of temperatures. Germanium micro-alloy diffused transistors will be available later in 1958, to provide switching at rates well above the limits of thermionic valves with amplification at 250 Mc/s or higher. To enable the industry to develop equipment incorporating these transistors, Semiconductors, Ltd., is making sample quantities available from the United States.

"What is Meant by Practical Training?"

Sir Walter Puckey's address to the Council of the Institution of Production Engineers last October, under the above title, has been reprinted and is now available in booklet form. Copies may be obtained from the Publications Department of the Institution, 10 Chesterfield Street, London, W.1, price 2s 6d each, post free.

Radio Component Show, 1958

The 15th annual Radio Component Show organised by the Radio and Electronic Component Manufacturers' Federation is to be held at Grosvenor House and Park Lane House, London, W.1, from 14th to 17th April, 1958. Admission will be by invitation only and applications for tickets should be made to the secretary of the Federation, 21, Tothill Street, London, S.W.1.

H.F. Furnaces for the Mint

For melting a variety of coinage alloys, including cupro-nickel for half-crowns, florins, shillings and sixpences, the Royal Mint has ordered from Birlec, Ltd., two 6 cwt high frequency furnaces each rated at 150 kW.

Fibre Pipe Production

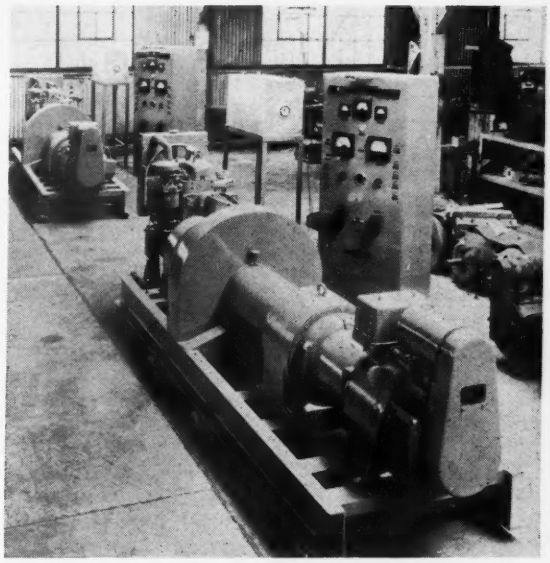
In order to meet a continued heavy demand for its pitch fibre drain pipes and cable conduit, Union Fibre Pipes (Great Britain), Ltd., has installed additional plant at its Harefield, Middlesex, factory which will enable output to be doubled.

Arc-Welding Electrodes

A new range of arc-welding electrodes, particularly suitable for vertical and overhead welding in addition to welding in the flat and horizontal positions, has recently been introduced by the English Electric Co., Ltd., Welding Electrode Division, Clayton-le-Moors, Accrington, Lancs. These electrodes, known as "Vohees," have been developed primarily to meet the needs of the ship-building industry, and also of users who prefer to have one electrode for all welding positions. "Vohees" are manufactured in sizes from 12 s.w.g. to ¼in diameter. Electrodes from 12 s.w.g. to 6 s.w.g. inclusive are suitable for overhead work, from 12 s.w.g. to 4 s.w.g. for vertical work, and the complete range for all horizontal - vertical welding.

These electrodes are of the medium penetration type, suitable for welding with poor fit-ups. They give a stable arc, can be used with low current and produce little spatter. No special welding procedure is required. Slag is of the fluid, quick-freezing type, being easily removed and often self-detaching.

Designed to operate with a.c. or d.c. the B.S. 1719 classification of these electrodes is E317 and the American classification is E7013. They also comply with the requirements of B.S. 782, B.S. 639 and B.S. 2549. Lloyd's Register of Shipping, the Ministry of Transport and the Admiralty have approved their use for the welding of mild, D, DW and S quality steels.



Continuity sets for telephone exchanges on test at the works of Dale Electric (Yorkshire), Ltd.

Heating Publicity

Dimplex, Ltd., has issued a folder containing details of its advertising programme for the coming season for its electric heaters. This includes, in addition to particulars of advertising in national periodicals, copies of booklets on "The Dimplex Home Warmth Plan," "The Dimplex Heating Plan for Commerce and Industry," a trade price list, and a block service broad sheet. This folder has been sent to 5,000 clients, including wholesalers, retailers, stores and Electricity Boards.

Colliery Electrification

Hafod Colliery, near Wrexham, is being changed over from steam to electrical power and is the third in North Wales to be so converted.

Telephone Exchange Plant

The accompanying picture shows two continuity sets on test in the works of Dale Electric (Yorkshire), Ltd. These units are 10 kVA output, 230 V, single-phase, 50 c/s, and are for installation in two major telephone exchanges of the Commonwealth. The engine is a Ruston 2YC, running at 1,500 r.p.m. and developing 24 b.h.p., and is coupled to the flywheel by means of a magnetic clutch. The driving motor is of Brook Motors manufacture, and the alternator is a Crompton "Magnicon." The complete unit is mounted on anti-vibration mountings.

Teaching Aids

A Teaching Aids Sub-Committee has recently been formed by the Science Masters' Association to collect information concerning teaching aids and prepare lists of these for circulation to members. It would be appreciated if representatives of industrial organisations would supply the Committee with the details of any booklets, wall-charts, models, showcases, filmstrips, etc., they may have which would be of use to schools. The details should include the name of the teaching aid, type, cost, etc., and be sent to the secretary, 24, Coniston Road, Bromley, Kent.

Educational

Particulars of post advanced lectures in electrical and mechanical engineering at technical colleges in its area during 1957-58, are now available from the Manchester and District Advisory Council for Further Education, Deansgate, Manchester.

The Regional Council for Further Education for the South West, 12, Lower Castle Street, Bristol, 1, has issued a bulletin of special courses in higher technology during the 1957-58 session at the various technical colleges in its area.

Lamp Catalogue

Philips Electrical, Ltd., has published the 1957-58 edition of its lamp catalogue, copies of which are available from all Philips regional and branch offices. The catalogue is fully illus-

trated and is divided into three clearly-marked sections: tungsten, fluorescent and discharge lamps; motor car, vehicle, moped, scooter and cycle bulbs; photographic, projector and infra-red lamps. Each section is indexed and separate price lists are contained in a pocket on the inside back cover.

Overhead Equipment for Glasgow Railway Electrification

As reported in our last issue, Pirelli-General Cable Works, Ltd., has been awarded a contract by British Railways, Scottish Region, for the erection of the overhead contact line equipment for the first stage of the Glasgow suburban railways electrification scheme. This electrification is being carried out on the single phase, 50 c/s system at 25 kV and 6·25 kV, the lower voltage being used in areas where clearances are restricted. The catenary will be of 19/083 cadmium copper with a cross section of 0·101 sq in (copper equivalent 0·082 sq in) and the single contact wire will be of solid grooved cadmium copper of 0·166 sq in cross section (0·14 sq in copper equivalent), giving a combined copper equivalent cross section of 0·222 sq in.

In connection with this contract, Pirelli-General will be able to call for technical assistance from Brown-Boveri & Cie. A.G. of Mannheim in accordance with an agreement which is in existence between the two companies. Brown-Boveri have very extensive experience of railway electrification on the high voltage a.c. system.

Water De-salting Apparatus

During a recent visit to the Rickmansworth works of William Boby & Co., Ltd., we saw a demonstration of a newly developed electrodialytic membrane de-salting equipment which will shortly be sent to the Libyan Public Development and Stabilisation Agency for installation and operation in Tobruk. The object of the plant is to produce at an economic price a potable water for domestic and agricultural purposes from brackish water with a high salt content. Hitherto all processes with this object have depended upon evaporation and distillation, which are costly; even the use of solar heat proves expensive in capital and maintenance costs.

The principle of operation of the plant is that the brackish water flows through a cell formed from two ion-permeable membranes. One of the membranes is permeable to positive, and the other to negative ions. A small electric current is passed through the cell between two electrodes situated outside it. Rinse water flows in the electrode compartments. The ions forming the salinity are attracted towards the electrodes according to their electrical charge. The effect is that the ions in the water passing through the cell move out of this water through the membranes into the rinse water flowing through the electrode compartments. The rinse water is discarded. The water leaving the cell is de-salted. The process of de-salting is not complete without recirculating the water, and as a matter of fact it will be stopped short in all ordinary use at a point where there is still some salinity left in the water, but the amount will be so small that it will be tasteless and potable in all respects. This is done for economy.

Electrical consumption is small and it is possible to de-salt water so that it is fit for human consumption for about 7 kW per 1,000 gal of water. This assumes that the water is of normal brackish quality, containing about 5,000 parts per million of salt. This is a good deal less than is found in sea water, but is nevertheless representative of a very large part of the world's natural water supply.

Fluorescent Lamp Price Reduction

A reduction from 25s to 20s in the price of "Osram" 8ft 125 W guaranteed tubes, effective from 9th September, is announced by the General Electric Co., Ltd. The tubes are not subject to purchase tax.

A similar announcement regarding "Mazda" fluorescent tubes has been made by the A.E.I. Lamp & Lighting Co., Ltd.

Fluorescent and Discharge Lighting Booklet

Atlas Lighting, Ltd., has issued a new edition of its technical pocket book of Atlas fluorescent and discharge lighting which contains 84 pages of technical data. The new issue is based largely on previous editions, with the sections on fluorescent tubes, control gear and fittings brought up to date. An addition introduces certain data on obsolete fittings and their replacement gear. Copies of the booklet are available free of charge to electricians and engineers responsible for the installation or maintenance of fluorescent lighting equipment, from the company at 233, Shaftesbury Avenue, London, W.C.2.

Remploy Exhibition

A trade exhibition is being held by Remploy, Ltd., the national organisation employing the disabled, from Monday to Friday next week, at 23, Savile Row, London, W.1. The products shown will be representative of the wide range made in the ninety factories throughout the country, and the various groups will include one devoted to electrical appliances.

Refresher Course for Plant Engineers

Lord Sinclair, Pro-Chancellor of the University of Bristol, is sponsoring a comprehensive refresher course for senior works and plant engineers which is to be held at Bristol University this winter. Organised by the Education Committee of Incorporated Plant Engineers, in collaboration with leading industrialists and technical authorities, it comprises 19 weekly lectures on Tuesday evenings commencing 15th October. The fee for the course is four guineas and copies of the syllabus and full particulars may be obtained from the secretary to the refresher course, University Engineering Laboratories, University Walk, Bristol, 8.

Trade Announcements

An International Products Division, with world-wide representation, has been formed by **Thermotank, Ltd.,** to handle the sales and distribution to the trade of various products concerned with air conditioning, heating and ventilating. The products handled by the new organisation will not be confined only to those manufactured by the parent company, but will include eventually items produced by concerns in many overseas countries

Belco London, Ltd., has moved to Gillingham House, 38/44, Gillingham Street, London, S.W.1 (telephone: Tate Gallery 0811) where it has offices, warehouse, and showrooms.

Mr. N. Provend has been appointed to represent the Southern Scottish interests of **Small Electric Motors, Ltd.,** and his address is at the company's Scottish office, 22, Pitt Street, Glasgow.

Mr. J. Hubble has been appointed a lamp and lighting salesman in the Leicester office of the **A.E.I. Lamp & Lighting Co., Ltd.**

The **English Electric Co., Ltd.,** has appointed Mr. K. A. Aldridge as sales representative for the domestic appliance and television division. He will be based at the company's Birmingham branch and will be covering the Midlands Electricity Board areas of Staffordshire, Worcestershire, Gloucestershire, Shropshire and Herefordshire.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 21st September:—

MCMICHAEL. No. 755,275. Class 9. Radio and television instruments; and sound reproducing instruments; and parts.—McMichael Radio, Ltd., Wexham Road, Slough, Bucks.

UNIVAC. No. 764,700. Class 9. Electric vacuum cleaners, domestic polishing machines and combined vacuum cleaning and domestic polishing machines.—T. L. Whitehead, 73, Edward Street, Brighton.

SNAPATTIC. No. 765,655. Class 9. Radio and television aerials.—Belling & Lee, Ltd., Great Cambridge Road, Enfield, Middx.

HYDRINA. No. 765,961. Class 9. Lifting magnets; electrically operated valves for automatically controlling the flow of fluid in pipe line systems; and electric apparatus for use in the supervision of industrial apparatus and machinery and for automatically controlling the operation of such apparatus and machinery.—Hydrel Akt.-Ges., Romanshorn, Switzerland. Address for service, c/o J. E. Evans-Jackson & Co., 49, Albert Hall Mansions, Kensington Gore, London, S.W.7.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Block Storage Heaters

OFF-PEAK thermal storage heating has undoubtedly come to stay. It is generally recognised as the most efficient and economical way of heating buildings, yet its best-known and most popular version—the block storage heater—may not be used in the ordinary dwelling house or, indeed, for any domestic premises, without being subject to purchase tax, for, when the block storage heater was first introduced into this country the purchase tax authorities permitted it to be sold free of tax only on condition that it was solely for industrial use. Since then, vast improvements have been made in the design and manufacture of block heaters, and it has now been proved that they are ideally suited for houses and flats.

It is surely time, therefore, for the Chancellor of the Exchequer to review the situation, which is full of inconsistencies. For example, newly-built houses or blocks of flats can have tax-free off-peak heating provided it is in the form of floor heating. Old homes being converted into flats to ease the housing pressure may *not* have it because, for them, floor heating is not practicable and the obvious alternative—the tax-free block heater—is not permissible. Again, in a new block of flats which is being equipped with floor heating, there are often places where cable cannot conveniently be laid and where block storage heaters would be the obvious way of completing the off-peak scheme: but tax-free block heaters may not be installed.

We are constantly being exhorted to use electricity at off-peak times in the public interest, to help industry by spreading the load; and equally often we are exhorted to support the national campaign for clean and smoke-free air in cities. All other comprehensive central heating systems, including those using fuel other than electricity, are exempt from purchase tax and can, therefore, be installed tax free in domestic, as well as in industrial buildings. Why should block storage heaters be the sole exception?

London, S.W.1. E. C. GREEN,
Thermodare (Great Britain).

Professional Engineers' Status

THE leading article in your issue of 30th August characterises the new programme recently announced by the Engineers' Guild as "laudable objects," and such support for our aims is welcome. At the same time, the term "laudable" tends to be applied to worthy enterprises the success of which remains in doubt, and indeed you go on to say that "the Guild first of all needs to publicise itself and recruit many more members. Not until that has been done will it be influential enough to secure the ends for which it is campaigning."

We believe that the execution of the programme described in your columns will directly benefit every individual professional engineer and the profession as a whole. How far and how fast this can be achieved will depend, as you rightly imply, on the degree of support which the Guild receives. In his presidential address to the British Association, Professor P. M. S. Blackett, F.R.S., referred to the wartime "wisecrack" about "offering all aid short of help" and it is precisely this attitude on the part of great numbers of professional engineers which has handicapped the Guild in the past. The membership of the National Society of Professional Engineers in the United States rose steadily from the end of the war to a total of 38,000 in June, 1956. As a result the Society can take much of the credit for the admittedly far higher status of the professional engineer in America than in this country to-day.

May I conclude on a more encouraging note. The description of the new programme which appeared on page 367 ends with the statement that "it will be necessary to raise the subscription of members and associates by £3 and £1 respectively, as from 1st October next." Lest any of your readers should be struck by the apparent uncertainty of the new rates, as well as by the size of the increase, I ought to make clear that for "by" should be substituted "to."

London, S.W.1. J. G. ORR,
Secretary,
Engineers' Guild.

Electric Furnaces

I HAVE read with interest your editorial in the *Electrical Review* of 23rd August, and Mr. R. W. Evans' article on page 313. I realise that you had some initial difficulty in following up the earlier articles by Mr. Howard and myself in 1954 by an article by a steel maker, but now that this has appeared, I think there would have been greater interest in Mr. Evans' conclusions if they had been supported by some figures of the country's output of low carbon steels. Mr. Evans makes the point that certain of this steel from a metallurgical point of view can only be produced by open hearth furnaces, but I think also it would be true to say that many others of the low carbon steels can be produced quite well by the electric furnace.

Is it not possible from the steel production figures that are available in this country to indicate the tonnage in the various grades of low carbon steels which could be quite efficiently dealt with in electric furnaces from the steel maker's point of view?

Whilst it may be true to say that in the preparation of the Battelle Report the American steel makers had very little hand, I think if there had been very serious criticism from them whilst the Report was being prepared, surely cognisance would have been taken of it before the information and conclusions that were drawn from the Report itself were so widely circulated.

Weeton, nr. Leeds. R. L. GAUNT.

Rural Preservation Conference

The National Conference of the Council for the Preservation of Rural England will be held at Hastings from 17th to 19th October. The headquarters will be at the Queen's Hotel and the meetings of the Conference will be held at the White Rock Pavilion. The proceedings will include an address by Lord Lucas on "The Nuclear Power Programme and its impact on the Countryside." Conference forms are obtainable from the secretary of the C.P.R.E., 4, Hobart Place, London, S.W.1.

T.U.C. RESOLUTIONS

NATIONALISATION, FACTORY CONDITIONS AND TECHNICAL EDUCATION

DURING last week's proceedings of the Trades Union Congress at Blackpool a composite motion instructing the General Council to work for the implementation of a policy of extending public ownership to some of the industries and services not so far nationalised was carried by a substantial majority.

Mr. W. L. Heywood, chairman of the General Council's Economic Committee, said that progress was being made. The General Council and the Confederation of Shipbuilding and Engineering Unions had reached agreement on one section of the engineering trades over nationalisation and on one section dealing with the aircraft industry. Replying to Mr. Bryn Roberts, general secretary of the National Union of Public Employees, who moved the resolution, Mr. Heywood said the General Council did not regard the Labour Party document as being irreconcilable with the general programme of public ownership to which Congress was committed. It was a necessary adjunct to the Party's authority to nationalise whole industries as and when desirable.

The motion was carried.

Other subjects dealt with during the week included education and training. The Association of Supervisory Staffs, Executives and Technicians expressed its concern at the shortage of technical personnel in industry and commerce. It believed that unless immediate steps were taken to overcome the deficiency, productive capacity was likely to be seriously damaged and living standards endangered. The motion called upon the General Council to urge the Government: (i) that basic educational standards be raised by an increase in the number of comprehensive and technical schools; (ii) that steps be taken to attract into the technical teaching profession more qualified men and women through improvements in salary scales and conditions; and (iii) that suitable schemes for the day release of young people in industry beyond the age of 18, where necessary, should be initiated under the joint control of the Ministry of Education and Youth Employment Service.

Factory Heating and Ventilation

A composite motion drew attention to the need to strengthen the Factories Acts, and requested the General Council to make representations to the Government to secure amendment of the Acts or regulations for better control of heating and ventilation in all factories and workshops in which heat processes were employed; sufficient seating and facilities for hot meals in all factories and workshops employing 50 or more workers; and facilities for dealing with sickness among women, including rest rooms.

The motion also requested the General Council to explore the possibility of amending the section of the 1937 Factories Act which deals with the employment of women and young persons. It asked for the permissible hours of work to be reduced from 48 to 44, the number of hours of overtime allowed to be reduced from 100 to 60 a year, four hours in any one week and 15 weeks in any one year. The motion was remitted to the General Council.

A considerable time was spent discussing pensions and health matters. There was a unanimous demand for immediate and substantial increases in pensions, and Congress welcomed in "general principle" the Labour Party's superannuation for all plan. There was also a demand to end all charges for medical prescriptions.

Introducing a motion on fuel and power co-ordination, Mr. J. Dutton, of the Association of Scientific Workers, said that the early planning of the coal industry was inadequate. While congratulating the National Coal Board on increasing coal output by 26 million tons per annum since nationalisation and the Central Electricity Authority on its far-sighted plans for the generation of electricity from atomic energy, the mover believed that to close the fuel gap it would be necessary to take vigorous action to secure more detailed co-ordination of power production from the three main sources, and greater efficiency in the use of fuel.

The work of the British Coal Utilisation Research Association had shown the way, and it was essential that power should be given to the National Industrial Fuel Efficiency Service to secure action in the industrial field and to local authorities in the domestic field.

Mr. Ernest Jones, president of the National Union of Mineworkers, supported the resolution. Many industrial concerns were using imported oil when they could make use of the increasing output of small coal. Nationalisation was only one step in the efficient organisation of the power industry. Rationalisation and planning must follow.

The motion was carried.

Another resolution which received the support of Congress dealt with automation. It declared that increased production must be used to benefit the whole community and improve the conditions of workers. Mr. H. Knight, of the Association of Supervisory Staffs, Executives and Technicians, pointed out that since last October 74 new companies had come into existence for the sole purpose of exploiting the computer.

A composite motion on wages and economic policy protested vigorously at the Government's persistent disregard of the views expressed by the trade union movement. It went on to declare that while the unions had no wish to chase an inflationary spiral, they were "not prepared to accept the imposition of a policy, the effect of which would be to debase the living standards of the workers and accordingly rejects the principle of wage restraint in any form." The motion reaffirmed "the determination, while prices and profits remain uncontrolled, to take such steps, industrially, as will ensure that wages keep pace with rising costs." It also reaffirmed belief and confidence in the principle of collective bargaining.

Except for the abstentions of the Civil Service unions and the National Union of Bank Employees, who objected to the political reference in the motion, the resolution was carried unanimously.

Mr. W. L. Heywood introduced the section of the General Council's report dealing with the European Free Trade Area. "Possibly this is the most important post-war proposal that Congress has ever been called upon to consider," he said. The General Council had come to the conclusion that, on balance, it was right that this country should seek to be associated with this movement. "But," he said, "I must make it clear that we arrived at that conclusion not because we were attracted by a nice-looking theory, but in a spirit of careful assessment of the facts."

The General Council were asking for conditions. It was their view that they ought only to support these proposals if the resulting economic expansion would provide the continuation of full employment and higher standards of living. They had therefore asked the Government for a declaration in the treaty that full employment would be a primary part of the Government's policy. They had asked the Government to ensure that the impact of change should be softened, for those likely to be affected, by unemployment pay on an adequate scale for workers displaced, grants for workers who had to move to another locality and re-training schemes.

Developments in Brazil

Legislative Measures to Accelerate Expansion

FROM OUR RIO DE JANEIRO CORRESPONDENT

THE Chamber of Deputies and Finance Committee of the Brazilian Senate have approved a Bill authorising the Union to constitute the Empresa Centrais Electricas Brasileiras S.A. (Electrobras), a mixed-economy society. Electrobras will administer the resources of the Federal Electrification Fund, act as the executive agency of the National Electrification Plan (see *Electrical Review*, 4th June, 1954) and be the holding company for the federal electrical enterprises, Cia. Electricidade de Manaus and Hydroelectrica do Sao Francisco, and any others that may be organised in future.

Although modelled on the Petrobras law, which instituted a state monopoly for the oil industry, the Bill contains nothing to discourage private initiative, national or foreign. Article 2 reads: "The functions of Electrobras are to study, plan, construct and operate electric power plants and distribution lines, especially those referred to in the National Electrification Plan. It may also manufacture electrical material if private enterprise is unable to do so with the official assistance authorised by law." Article 15 stipulates that state and private enterprises desiring federal financial aid, other than bank credits or in excess of normal financing possibilities, may associate themselves with Electrobras, who will not, however, exercise financial control. Only federal electrical enterprises will be governed by the holding company.

The project aims at co-ordinating the work of public undertakings and ensuring rational utilisation of the resources of the Electrification Fund. These resources are derived from the sole tax on electrical consumption, 40 per cent of the proceeds pertaining to the Union and 60 per cent to States and municipalities; 4 per cent of the excise tax on commodities in general; and 0·2 per cent of the tax on exchange remittances.

The Council for Economic Development estimates that Brazil will need an additional 2,000 MW by 1961 and a further 3,000 MW by 1965. By 1965 the Electrification Fund's receipts will have totalled 67,500 million cr., leaving 45 per cent of the expenditure in national currency to be covered by private enterprise or increased taxation.

Electricity Supply Investments

With a view to encouraging private capital, President Kubitscheck has asked Congress to approve, with the minimum of delay, a Bill altering the economic and financial regimen of supply companies. In order to guarantee equitable remuneration of capital the Bill authorises revaluation of the investment on the basis of the original cost, plus total expenditure incurred in executing the concession, expressed in national currency. This sum, together with the reserve and amortisation funds, will be considered as the "remunerable investment." Its value, as well as that of works in hand and stocks, will be adjusted every three years to compensate for variations in the purchasing power of the cruzeiro, as determined by the index of the National Economy Council. These monetary corrections will be made after less than three years if the index has varied more than 20 per cent during the interval. Whenever such corrections are applied tariffs will be revised and adjusted so as to ensure a return of 12 per cent per annum on the remunerable investment.

Tariffs will be fixed to cover costs of services, maintenance of installations, rates and taxes, constitution of depreciation and reversion, or amortisation, funds and repayments on loans. If the concessionaire proposes revision and the competent authority fails to report on the proposal within 180 days the new tariffs may be applied pending final decision. Tariff increases, resulting from the application of monetary corrections, may not exceed 20 per cent in any one year. Tariffs will be revised whenever variations exceeding 20 per cent occur in the cost of fuel; the exchange rate for remitting interest on loans or amortisation payments; and salaries or obligations imposed by the Social Provident Institution.

Decree No. 4019 authorises the Federal Government to call for public tenders to exploit light and power services in zones other than centralised regions. Concessions may be granted to utilise hydraulic power in sections, or throughout the entire course, of rivers and distribute electricity, with a monopoly in specified areas.

A Bill now before Congress proposes to create a Federal Administration of Water and Power to co-ordinate policy regarding public water courses, use of hydraulic energy and electric power, at present subject to the control of various departments. In his message to Congress the President stresses the Government's intention to "encourage private initiative . . . in order that it may continue to participate vigorously in the expansion of the country's electrical industry."

Expansion Programmes

The Brazilian Bank for Economic Development (B.N.D.E.) will advance 1,500 million cr. (say £7·5 million) to finance expansion programmes this year; Federal allotments will provide 2,500 million cr. exclusive of any supplementary credits, while State Governments and private enterprises plan to invest between 3,000 and 4,000 million cr.

The bulk of the expenditure will be incurred in the Central-South region, an area of 386,000 square miles embracing Espirito Santo, Minas Gerais, Sao Paulo, Rio de Janeiro, Federal District and Northern Parana. The value of industrial production in this region represents 75 per cent of that of the whole country and development has been retarded by power shortages in recent years. Rationing, in force since 1951, was suspended in 1956, but further shortages are predicted in the near future.

According to the programmes announced by Government and private enterprises, installed hydro-electric capacity in the Central-South region will be raised from 2,800 to 4,100 MW by 1960 and to 6,300 MW by 1965. (These figures do not include thermal capacity, which amounted to 667 MW at 31st December, 1956.) The

most important projects are those of Furnas (Federal Government), 1,100 MW; Tres Marias (C.E.M.I.G.), 480 MW; Peixotos (Empresas Electricas), 400 MW; Cubatao and Piratininga (Sao Paulo Light & Power), 390 MW and 250 MW.

The first two 40 MW generators of the Peixotos station started operating in April last. The project has cost U.S.$41 million to date and an additional U.S.$35 million will be required to raise capacity to 400 MW.

The contract for building the Tres Marias dam was signed by Centrais Electricas de Minas Gerais (C.E.M.I.G.) and the American consortium in May last. Utah Construction Co., Raymond Concrete Pile, Kaiser Engineers and Morrison Knudsen form part of the consortium. The contract price for the work, which is to be completed by 1960, has not been announced. An agreement has also been concluded between the Sao Francisco Valley Commission and B.N.D.E. for a 2,620 million cruzeiros loan to finance the project (see *Electrical Review*, 13th July, 1956). The cost of the dam has been roughly estimated at between 3,600 million and 4,500 million cruzeiros, that of the power station at 4,000 million.

Central Electrica de Furnas has been founded to build a hydro-electric station at Furnas, on the Grande River, which will have an eventual capacity of 1,100 MW. The Union will hold 51 per cent of the company's voting shares, the remainder being divided between Sao Paulo and Minas Gerais, with non-voting participation by the Light & Power and Empresas Electricas Brasileiras. The first generators, with a combined capacity of 360 MW, are expected to start operating in 1961.

President Kubitscheck has agreed to participate in the Sao Paulo Government's project to build hydro-electric stations at the Urubupunga Falls, on the Parana River. This undertaking is not included in the expansion programmes referred to above. The Jupia plant will be equipped gradually with eighteen 75 MW generators, the second station to be built, at Ilha Solteira, with fifteen 110 MW units. A mixed-economy society, in which private enterprises and the States of the Parana Basin, as well as the Federal Government, will participate, is being organised to carry out the project, which will benefit the States of Sao Paulo, Mato Grosso, Parana and Minas Gerais.

The transfer of the Federal District and capital city from the coast to the Central Plateau of Goias, an obligation included in every Brazilian Constitution since 1891, is to be implemented before President Kubitscheck's term of office expires in 1961. The inauguration is fixed for 7th April, 1960. The Raymond Concrete Pile Co. (U.S.A.) has obtained a contract to erect 16 public buildings, of ten floors each, and a 25 MW hydro-electric station on the Paranaoa River. The Export-Import Bank has approved a U.S.$10 million loan to finance purchases of electrical equipment and structural materials for the buildings. An international airport is being built and motor roads and railway tracks laid to connect Brasilia, the new capital, with Rio, Sao Paulo and Goiania.

REGISTERED TRADE AGREEMENTS

THE Registrar of Restrictive Trading Agreements has now received the second Board of Trade direction to refer to the Restrictive Practices Court registered agreements relating to the supply of certain goods. From the list we have selected the following items of electrical interest with some of the more important features of agreements given in parentheses:—

Copper wire rods, hot rolled (recommendations for prices and discounts); electric domestic cookers (fixing of discounts for certain classes of customers and prices for specified extras); f.h.p. motors, not below 1/20th h.p. (fixing of minimum prices, quantity discounts and discounts for different classes of customers); electrical subsidiary power instruments—ammeters and voltmeters of the dynamometer indicating type, deflectional frequency indicators, power factor indicators, rotary synchroscopes and wattmeters (fixing of minimum prices and maximum discounts for different classes of customers); transformers (fixing of minimum prices and fixing of discounts for various types of transformers); electronic valves, including cathode ray tubes (exclusive dealing arrangements between manufacturers, dealers and users, fixing maximum discounts, and restrictions on imports); industrial furnaces (fixing of terms and conditions); pumps and pumping plant (fixing of minimum prices and preferential discounts, standard conditions of sale and contract); water tube boilers intended to be installed on land (selection and adjustment of tenders prepared for home and some overseas contracts).

Agreements relating to transformers, electronic valves and cathode ray tubes have already been the subject of reports by the Monopolies Commission. These reports were among those on which, following the passing of the Restrictive Trade Practices Act, the Government took no action, leaving registered agreements to be considered by the Restrictive Practices Court.

The Restrictive Practices Court has to decide whether the restrictions which have made an agreement registrable are contrary to the public interest or not. It is the Registrar's function to ensure that the Court receives all possible assistance in reaching its decision. Anyone who can furnish information from his own experience of the effects of agreements about any of the commodities listed is asked to communicate with the Solicitor to the Registrar at Chancery House, Chancery Lane, London, W.C.2.

Technical Courses

A SIX-MONTHS' full-time course for the Institution of Electrical Engineers Part III and/or the Institution of Mechanical Engineers Part C examinations will be held at the South East London Technical College, Lewisham Way, S.E.4, from October to March. Particulars can be obtained from Mr. C. W. Robson, head of the Department of Electrical Engineering and Applied Physics.

A course on nuclear energy applied to electrical engineering will be given by Messrs. B. Fozard and T. T. Black at the Technical College, Bradford, on Thursdays throughout the College session, commencing on 26th September. The fee for the course is £1 10s and application forms can be obtained from the Principal, Technical College, Bradford, 7, returnable during the week commencing 16th September.

Among the subjects for which courses will be held at the Sir John Cass College, Jewry Street, Aldgate, London, E.C.3, in October are electronics, electronic computing systems, radio-chemistry and radioactivity, industrial law, quantum mechanics, mathematics and scientific principles of fuel technology. Prospectuses of these and other courses can be obtained from the secretary at the College.

A course of six lectures on "The Technique of Technical Writing," will be given by Mr. G. Parr, technical director of Chapman & Hall, Ltd., at the Borough Polytechnic, Borough Road, London, S.E.1, commencing on 11th October. The fee for the course is 10s and enrolment forms should be sent to the secretary of the Polytechnic.

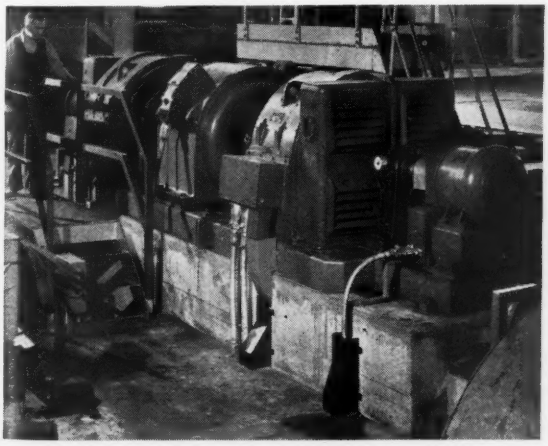
POWER FOR STEEL PRODUCTION

Electrical Equipment for a Cold Cut-Up Line

A LARGE proportion of the industrial demand for steel plate in gauges up to $\frac{3}{8}$in is now met by material produced from high-speed continuous rolling mills. Until recently plates over $\frac{3}{16}$in thick were obtained either from the mill as fly-sheared lengths, or as lengths of plate processed through the orthodox cooling bank and end shears. Either method restricted the potential capacity of a fast-moving continuous strip mill. The Steel Company of Wales, Ltd., has recently extended the use of coilers to cover all gauges up to and including $\frac{3}{8}$in, so it has been necessary to design and install a cut-up line capable of de-coiling, flattening and shearing these thicker gauges.

The 74in by $\frac{3}{8}$in cut-up line now in commission at the Abbey works is the first of its kind to be installed in this country, and is designed to cut strip from 15 ton coils into lengths ranging from 4ft to 36ft and to flatten and pile the cut lengths. It can be operated under automatic or manual control, the maximum speed of operation when cutting $\frac{3}{8}$in steel being 150 ft/min, rising to 250 ft/min for $\frac{3}{16}$in steel. The General Electric Co., Ltd., was the main contractor for the electrical plant and control gear for this installation, and was responsible for the design of the control scheme. Basically, this is a Ward-Leonard system operating in conjunction with control exciters which enable high cutting speeds to be attained with accuracy and complete stability. The consulting engineers for the contract were McLellan & Partners.

Above: General view of the 74in by $\frac{3}{8}$in cold cut-up line from the entry side. Below: The 700 h.p., 980 r.p.m. motor-generator set for the cut-up line



An interesting feature of the installation is that the control desks incorporate a new type of master control switch designed in conjunction with the consultants. These switches enable the operators to have large numbers of controls within easy reach while seated at their desks.

At the entry section of the line coils of strip are loaded by means of a coil carriage on to a pay-off reel, which is coupled to a 40 kW drag generator used to maintain constant tension in the strip during its passage through the section. On leaving the reel the strip enters a processor which flattens the material prior to shearing, and then passes to the entry tables and through a pair of pinch rolls to the Head Wrightson electrically driven up-cut shear. After shearing, the sheets pass to the delivery section of the line, which comprises the shear gauge tables, a roller-leveller, a further pair of pinch rolls, an inspection table with automatic rejection and a run-out table from which the finished sheets are piled ready for removal.

The control scheme provides for automatic operation, in addition to the usual facilities for manual control, threading and inching. When automatic operation is used, the whole of the entry section of the line stops each time a sheet is sheared; the shear gauge table starts and stops with the entry section, but the rest of the delivery section normally runs continuously. Under these arduous conditions, where the whole of the entry-section drives have to be accelerated and decelerated each time a cut is made, the rapid response of the control exciter system is of considerable value in enabling high output to be maintained from the cut-up line.

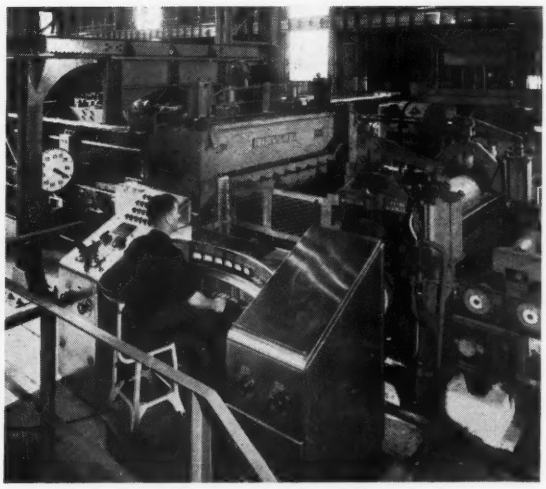
The d.c. power supplies for the various drives are obtained from a motor-generator set comprising a 700 h.p., 3·3 kV induction motor direct-coupled to two 0/300 kW, 0/400/500 V d.c. generators. This m.g. set also includes a 3 kW booster, which is connected in series with the drag generator, and a 15 kW exciter with a constant voltage output which provides the excitation for the motors driving the cut-up line.

The four-machine exciter set for the control of the

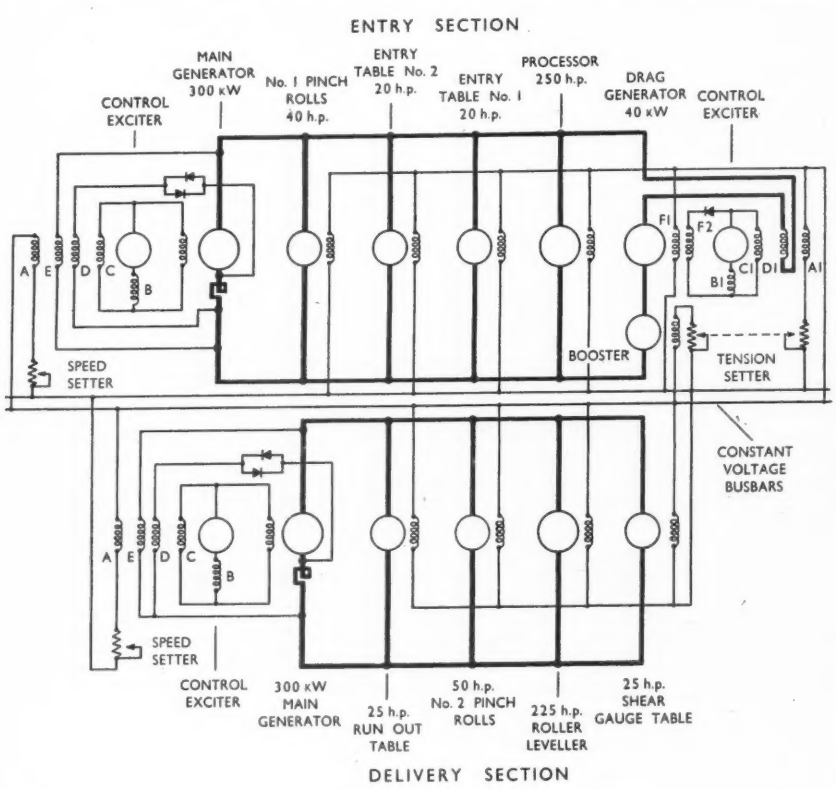
cut-up line is driven by a 10 h.p., 415 V squirrel cage motor and includes a five-field exciter associated with the entry side generator, a similar exciter for the delivery side generator and a four-field exciter for the drag generator. This exciter set is installed, together with the main d.c. switchboard, in the basement of a two-storey substation. The upper storey of the substation, which is at mill floor level, provides accommodation for the d.c. control gear.

The drag generator and the eight d.c. motors driving the various sections of the line are force-ventilated machines with separately excited fields. Cooling air is fed to each machine from a common air supply, either by trunking or by ducts in the foundation blocks, and is exhausted through louvred apertures. The processor motor is rated at 0/250 h.p. at 1,000 r.p.m. maximum, and that for the roller-leveller at 0/225 h.p. at 1,150 r.p.m. maximum, while the six machines driving the tables and pinch rolls total approximately 180 h.p. The main d.c. switchboard for the cut-up line is of sheet steel construction and is built in two portions mounted back-to-back and separated by a central gangway which enables ready access to be obtained to all back-of-board components for inspection and maintenance.

The operation of the complete line is controlled from console-type desks placed at the entry section, the up-cut shear and the finishing section. The control desk for the shear is constructed of stainless steel and the centre section embodies a total of 34 control switches which are arranged, together with the necessary indicating instruments, in two manuals. As the overall width of the new type switch is only $1\frac{1}{8}$in, the whole of the controls for the section are within easy reach of the operator's hands. Further advantages of these switches are that the contact arrangement can readily be adapted to suit all normal control requirements, and that the complete switch mechanism can be quickly unplugged from its housing for inspection and maintenance. The cabinets at the ends of the desk provide accommodation for the indicator lamps, emergency stop push-button and the various regulators and potentiometers associated with the control scheme. The shear control desk forms the principal control centre for the complete line; the desks for the entry and finishing sections are similar to the shear desk in design, though the number of circuits controlled from these is smaller.



The control desk for the up-cut shear



Simplified schematic diagram of the entry and delivery sections

The entry and delivery sections of the line are separately controlled, and each is equipped with its own generator and associated control exciter. The exciters are basically voltage-controlled, though a current-limiting feature is incorporated to prevent excessive acceleration and retardation of the line. The two main generators are identical, but the maximum voltage of the entry section generator is limited to 400 V, while the output of the delivery section generator at full speed is 500 V. This voltage difference enables the delivery section to run faster than the entry section, and so clear the cut lengths from the shear. Regulators for controlling both the crawl and running speeds of the line are provided on each desk.

As shown in the schematic diagram, the control exciters for the main generators are each equipped with five field windings, of which A and B are positive fields which tend

to increase the voltage output of the exciter, and C, D and E are negative fields which produce the reverse effect. A is the voltage setting field which enables the speed of the section to be controlled from the regulator on the control desk. B and C are stabilising windings, D is the current-limit field which is connected in series with a metal rectifier across the compoles of the main generator, and E is the voltage resetting field which is connected across the main generator.

The control system functions in the following manner. A voltage proportional to the desired speed of the section is fed to field A. The voltage output of the control exciter, and hence of the main generator, builds up until the voltage across field E nearly equals that across field A, the slight difference being sufficient to keep the main generator excited at the desired voltage. If the voltage fed to field A is reduced, field E will predominate and the voltage output of the exciter will be reduced until fields E and A are again almost in balance. If field A is reduced to zero, regenerative braking will be applied to stop the section. During acceleration or retardation, any increase in current above the set value of twice full load will cause the current-limit rectifiers associated with field D to become conductive. The resultant current in D tends to reduce the main generator voltage during acceleration and to increase the voltage during retardation, thus limiting the load current to the set value.

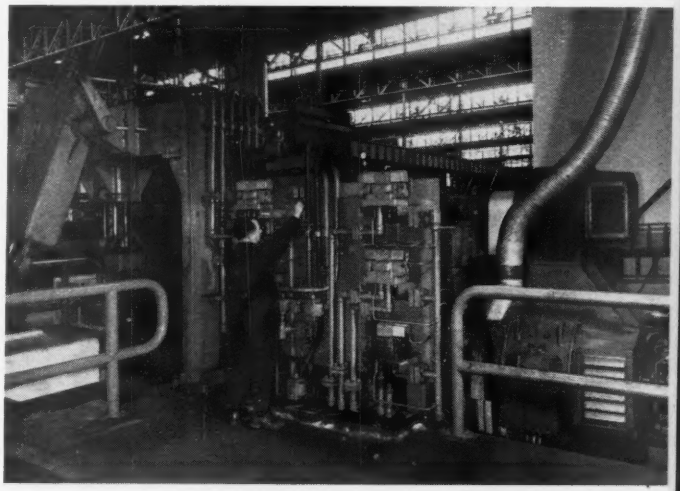
Stabilising field B is connected in series with the main generator field, while C is connected across the armature of the exciter. Under normal conditions the effects of the two windings are almost equal and opposite, but during rapid changes B will lag behind C because of the inductance of the main generator field. Field C, acting as a source of negative feedback, will then cause the output voltage of the exciter to fall, thus preventing hunting. In practice, B is made slightly more powerful than C, and acts as a self-sustaining series field for the exciter, so that a small difference between the setting and resetting fields will produce full output from the exciter, thus increasing the accuracy of the system.

The drag generator is used to maintain a constant tension in the strip during its passage through the entry section. The generator has two field windings, F1 and F2, of which F1 is excited from the constant voltage busbars and is set to give an empty-reel speed slightly slower than the entry section. The second field, F2, is energised from the control exciter via a blocking rectifier which ensures that field F2 can only assist field F1. In series with the drag generator is a booster which is excited from the constant voltage bars via a regulator ganged to the tension setter. This regulator is graded so that the booster produces a voltage proportional to the IR drop in the circuit. The booster is necessary to ensure effective control at very low speeds, and is also used for inching the drag generator and for providing stalled tension when the line is stopped.

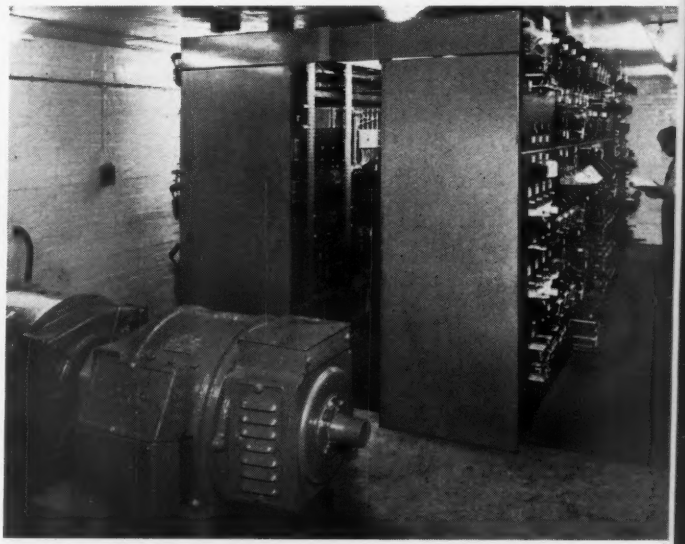
The control exciter for the drag generator has four field windings A1, B1, C1 and D1, of which A1 and B1 are positive fields which tend to increase the voltage output, and C1 and D1 are negative fields which reduce the output. Field A1 is the tension setting field which is excited from the constant voltage bars in proportion to the desired tension, and causes full field to be applied to the drag generator. As the coil of strip on the pay-off reel is unwound, the speed of the drag generator will increase in proportion with the decreasing coil diameter, and in consequence the back e.m.f. will rise causing the feedback current to increase. The current resetting field D1, which is in series with the main drag generator circuit, will then oppose field A1 and so reduce the drag generator field and consequently the back e.m.f. This process continues all the time strip is being taken off the reel, field D1 being slightly greater than field A1 to maintain the set tension. To prevent a loop from being thrown during retardation, the tension is increased to provide a component of current proportional to the braking torque.

Fields B1 and C1 of the control exciter are stabilising fields, B1 being connected in series with the controlled field and C1 across the armature of the control exciter. These windings act in similar manner to fields B and C of the exciters for the main generators, the functions of which have already been described.

When the line is operating under manual control, the various sections are under the individual control of operators seated at the three control desks, and interlocks are provided to ensure that there can be no change to



The drives for the entry section, showing the 40 kW drag generator (right foreground), with the 250 h.p. motor for the processor mounted above the generator



The basement of the substation, showing the main d.c. switchboard and the control exciter set

automatic control while the line is running. Dual controls are provided for inching the mandrel and processor, and a change-over relay on the master control desk at the shear enables the control to be transferred from the shear desk to the entry desk. When automatic control is selected, the starting and stopping sequences are initiated by limit switches actuated either by a cut length or by the leading edge of the advancing strip.

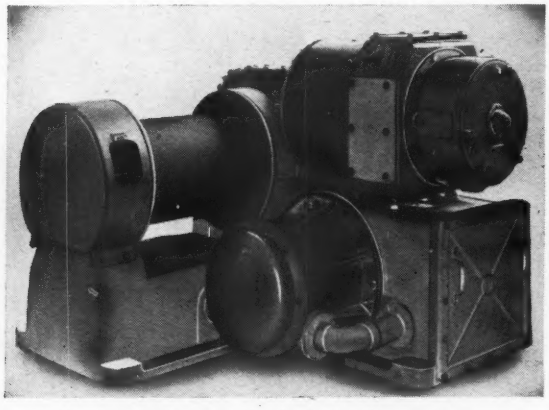
A comprehensive system of interlocks, relays and protective devices has been installed to prevent the line from being started until the shear motor and all a.c. auxiliary drives such as oil pumps, hydraulic pumps, and fans are in operation, and to prevent damage should the various controls be operated in an incorrect sequence. In addition, overload and field failure protection has been provided for all the driving motors, and the generators are equipped with both time-delay and instant-trip overload and overvoltage protection. Acknowledgment is due to the Steel Company of Wales, Ltd., for permission to photograph the installation and to publish this article.

Cargo Winch for A.C. Ships

A HIGH performance winch for cargo handling on ships with a.c. supplies has been developed by Laurence, Scott & Electromotors, Ltd. This winch, which is known as the "Corrector," is compact, yet all parts are readily accessible for maintenance, and its Ward-Leonard variable voltage control provides a performance which is strictly comparable with that of any high performance d.c. winch. One of the advantages of the new winch is that there are no heavy current surges on switching, such as are inevitably associated with direct drive by squirrel-cage or slip-ring induction motors. Since the power taken from the mains when the winch is in use does not exceed that demanded by full load the ship's alternator capacity and cable sizes can be kept to the minimum.

The winch is available in 3-ton or 5-ton capacities and has a speed range of 4:1 from light hook to full load without mechanical gear change. When hoisting or lowering the maximum safe speed is selected automatically on the high speed steps by a "load weighing" feature; lower speeds are available as selected by the operator. The winch is also arranged to stop automatically when the load touches down. Normal braking is by electrical means and no friction brake is fitted to control the load. A magnetic brake is provided, however, but only for holding the load at standstill and for emergency stopping. Apart from a deck mounting control pillar and a small starter which can be housed in any convenient position under cover, the winch is self-contained. The a.c. mains are run direct to the winch through the starter and there are no extensive heavy current interconnections between the winch and any control or auxiliary equipment. The remote control pedestal is connected to the winch by control cables of small capacity. Pedestals can be mounted in any convenient position and grouped in pairs to enable one operator to control two winches if desired. As can be seen from the accompanying illustration all of the electrical equipment is housed in watertight casings and no ventilators are fitted.

The "Corrector" was shown for the first time at the recent Engineering, Marine, Welding and Nuclear Energy Exhibition at Olympia, together with a working reproduction of a ship's a.c. installation for the drive of engine room and deck auxiliaries. The usual diesel driven alternator was represented by a motor alternator set, the alternator having "Altoreg" compounding with "Altomag" magnetic amplifier automatic voltage regulation, to give high performance when called upon to supply heavy starting currents in comparison with the alternator capacity, which is a feature of normal operating conditions.



Scott "Corrector" cargo winch for a.c. ships

Wire and Cable Maker's Jubilee

THIS year is the silver jubilee year of Aerialite, Ltd., and to mark the occasion the company entertained some 400 of its business associates and friends to dinner on Tuesday last week at Grosvenor House, London, over which Mr. L. S. Hargreaves, chairman and managing director, and founder of the company presided.

The toast of the company was proposed by Mr. M. Chapman Walker, managing director of Television for Wales and the West, Ltd., who referred to the company's contribution to the development of television since it commenced operating in 1932. He mentioned that the company had started with a capital of £4,000 and two employees and now had a capital of £250,000 and employed over 2,000. It had eight factories producing a wide range of products. The success of the company was a complete denial that Britain was no country for people of enterprise, courage and energy.

Mr. Hargreaves, in responding, reviewed the industrial scene over the past twenty-five years. He said that modern industry was a hard taskmaster which kept people on their toes leaving little time for leisure. The Aerialite business was broadly based and had not therefore been too affected by fluctuations. During the past twenty-five years he had seen many changes; the value of the pound had fallen and freedom had declined. If this trend continued we should have to take our place with the "C3" nations. Aerialite had done well. In 1951 it had made a profit of £148,000, and for 1957 it would exceed £450,000.

Mr. C. I. Orr-Ewing, Parliamentary Under-Secretary of State for Air, proposed the toast of "Our Business Associates and Friends," in the course of which he spoke of the European Free Trade Area, which he said would have the advantages of a "club" of 280 million people, a greater one than existed in the United States. There were those who feared that we might be swept out of business by sudden competition, but tariff barriers would be lowered gradually over a period of twelve years. He did not fear that it would give rise to unemployment. This country could stand on its own feet in competition with European countries.

Mr. H. Day responded in a speech in which wit and sound philosophy were happily blended.

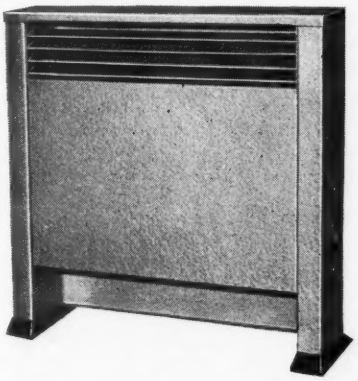
During the evening, Mr. P. Lovhoj, who had come from Denmark especially for the occasion, made a presentation to Mr. Hargreaves.

NEW ELECTRICAL EQUIPMENT

Convector Heaters

The "Floodwarmth Conp" convector heaters manufactured by UNITY HEATING, LTD., Chilworth Manor, Southampton, are used extensively in offices, homes, shops, etc., and as can be seen from the illustration their design is such that they harmonise with almost all types of furniture. They are available in 1, 2 and 3 kW sizes and the elements are housed in a steel cabinet with conveniently arranged terminal boxes. For loadings above 1 kW two-heat control is incorporated. A warm-glow lamp indicates when the heater is connected and also remains on when the element is switched off by the thermostat.

All models are available in a bronze or grey stove hammered enamelled finish and wooden feet, which greatly improve stability and appearance, are fitted at no extra cost. If required the heater can be secured to the wall, suitable slotted fixing holes being provided at the back. The 1 and 2 kW heaters measure 24in high by 27in wide and the 3 kW model measures



Unity Heating "Floodwarmth Conp" convector heater

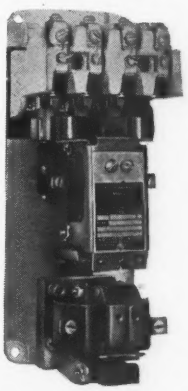
28in high by 30in wide. All measure 5in in depth. The prices range from £11 plus £4 16s 6d purchase tax (1 kW without thermostat) to £14 5s plus £6 5s 1d (3 kW with thermostat).

Mechanically-Held Relays

New mechanically-held relays designed to maintain the operating sequence of machine tool, electric furnace and similar processes, even in the event of supply failure, have been introduced by SQUARE D, LTD., 100, Aldersgate Street, London, E.C.1.

Known as Class 8508, the relay is basically an electrically operated switch which is closed by the momentary energisation of an electromagnetic coil and then held in that position by a mechanical latch. The relay is opened by the combined effect of gravity and spring action when a second coil is momentarily energised to release the latch. When both coils are de-energised, the relay may be either open or closed according to which coil was last energised.

For control circuits up to 600 V, 15 A



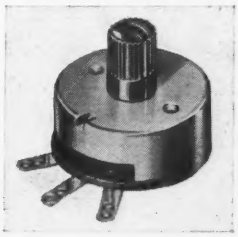
Square D mechanically-held relay, Class 8505

maximum, Class 8508 relays can be supplied with from two to eight poles with any combination of normally-open and normally-closed contacts.

Pre-set Potentiometer

The introduction to the commercial market of an economically priced pre-set potentiometer which is claimed to provide the reliability and performance of a moulded track, while costing no more than existing sprayed track types of control, has recently been announced by the PLESSEY CO., LTD., Ilford, Essex.

Basically, the method of construction consists of moulding the track directly on to a low cost insulant. Known as the type "PP" pre-set potentiometer,



Plessey Type "PP" commercial pre-set potentiometer

it is a cheaper development of the type "EP" moulded track control for applications where precision and low noise level are essential.

In general, the "PP" control retains the same physical dimensions and features of the "EP," such as simple fixing by 6 BA screws not more than ¼in longer than the panel thickness, and integral moulded knob. Retention of the moulded knob allows operation on a.c./d.c. equipment, thereby providing an additional safety feature. Another advantage is that complete reliability under arduous working conditions is assured by carbon to carbon contact.

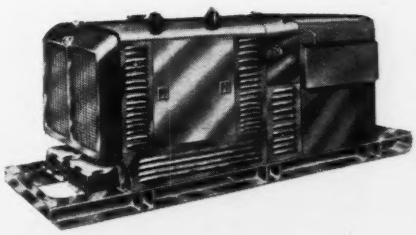
Rated at a maximum of half a watt over the entire resistance element, the type "PP" control is being manufactured in the normal resistance range 1,000 ohms to 2 megohms with a tolerance of ± 20 per cent. It has passed tropical exposure tests to RCS 122A Grade H3.

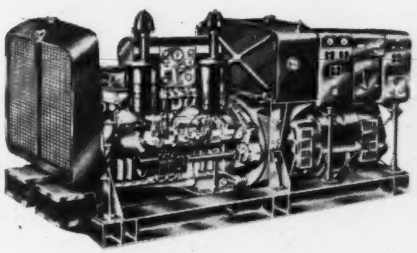
Generating Sets

A new range of generating set equipment, introducing a carefully planned scheme of standardised parts and extensive interchangeability, has recently been announced by HENRY MEADOWS, LTD., Fallings Park, Wolverhampton. The Meadows plan reduces the generating sets to three basic lines from which, by using standardised variants and rationalised additional items, virtually any operator can obtain exactly the type of equipment wanted.

The plan covers all known needs from bare engine to self-contained, trailer-mounted, "custom-built" generating sets. It extends through the whole range of applications for generating sets and power packs, stationary and portable, for primary generation and stand-by power. The complete range is based on power units with outputs of from 22 to 161 kW in the generating set range and 36 to 270 b.h.p. in the power pack range.

Meadows 63 h.p. diesel-engine generating set





GENERATION and DEVELOPMENT

Part of the promenade at Blackpool where the 1957 illuminations were switched on last Friday

East Midlands Consultative Council

The fortieth meeting of the East Midlands Electricity Consultative Council was held at Nottingham on 4th September. Mr. L. L. Perkins, who has been chairman of the Council since its constitution in 1949, was congratulated by the members on his reappointment and the Council extended their congratulations to Mr. C. R. King on his appointment as deputy chairman of the Central Electricity Generating Board.

The Council also gave consideration to 102 proposed new schemes already approved by the Board for reinforcing or extending the mains. These schemes include supplies for 2,394 new houses and 192 farms and other rural premises, the total amount of capital expenditure involved being approximately £680,600.

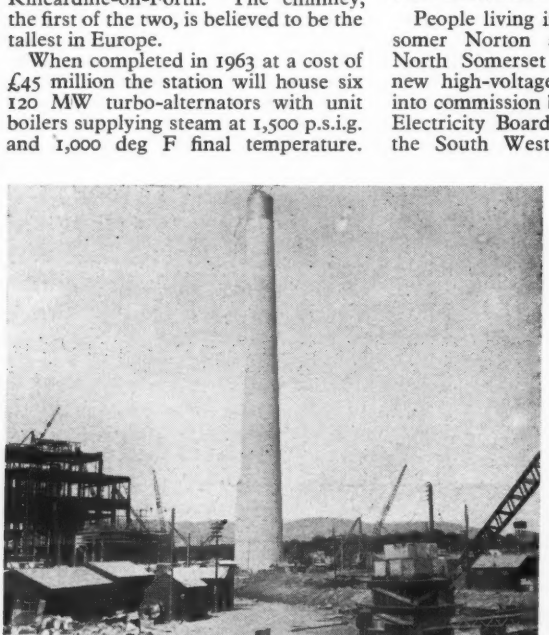
Kincardine Power Station

Two and a quarter million bricks have been used in the construction of the 400ft high chimney now completed at the South of Scotland Electricity Board's new generating station at Kincardine-on-Forth. The chimney, the first of the two, is believed to be the tallest in Europe.

When completed in 1963 at a cost of £45 million the station will house six 120 MW turbo-alternators with unit boilers supplying steam at 1,500 p.s.i.g. and 1,000 deg F final temperature. The first set is scheduled for commission in 1958.

To mark the present stage of construction, Mr. John Henderson, chief engineer of the Board, unfurled the Union Jack on a flagstaff at the top of the chimney. He said that the exterior construction of the stack had been completed in 14 months.

The station covers an area of about 140 acres, of which some 30 are still under cultivation. It was explained that, although agricultural land had been utilised for the site, it was likely that in 20 to 25 years' time about 265 acres of mud flats three miles down river would have been reclaimed for agriculture with the aid of waste matter from the station.



Kincardine power station showing the first 400ft chimney

New Somerset Substation

People living in the Radstock, Midsomer Norton and Wells areas of North Somerset will benefit from a new high-voltage substation just put into commission by the South Western Electricity Board in conjunction with the South Western Division of the Central Electricity Authority. The substation has cost about £140,000. Known as Radstock Main, it is close to a new 132 kV overhead line between Churchill and Melksham.

Mr. P. M. Wilson, the Board's chief engineer, explained that it had been necessary to reinforce the Board's distribution system at Radstock owing to the steadily increasing demand in the area. There were a number of coal mines and quarries in the vicinity and a continually mounting demand from other industrial and domestic consumers. He added that the new substation would mean a saving of some £12,000 a year on transmission costs.

Completion of Barking "C"

No. 44 boiler, the final major item of plant at Barking "C" station, was recently brought into commission.

Opposition to Jarrow Transmission Line

Jarrow Town Council is objecting to plans by the Central Electricity Authority for the erection of a 275 kV overhead line across the town. The cable is part of a new network to be constructed between Blyth power plant and Middlesbrough and will be strung on towers 130ft high. The borough engineer of Jarrow (Mr. H. W. T. Perkins) has suggested that the line should be constructed east of the route proposed by the C.E.A. This, he stated, would carry it over mainly industrial land and along the routes of new roads proposed in connection with the Tyne tunnel project. The Council's Development Sub-Committee is to interview the C.E.A. on the matter.

Cookers for Council Houses

Durham R.D.C. has received sanction to borrow £5,000 for the installation of electric cookers in council houses.

Loch Lomond Pumped Storage Scheme ?

The North of Scotland Hydro-Electric Board, which in July announced plans for a £24,500,000 scheme at Loch Awe, Argyllshire, including provision for the construction of the first large-scale pumped storage hydro-electric development in Scotland, may embark on a second scheme of a similar nature on the banks of Loch Lomond if tests and site investigations prove satisfactory.

These investigations have been going on for several months at two points on the loch. One of these is

near the existing Loch Sloy power station, Scotland's largest hydro-electric plant. The other is on the opposite side of the loch at Burn of Mar, near Balmaha. During off-peak periods surplus electricity would be diverted to pump water from Loch Lomond to a reservoir in the hills, this water being used to generate electricity during heavy load periods.

On 2nd September, Mr. J. S. Maclay, Scottish Secretary of State, and Mr. D. Renton, Parliamentary Secretary, Ministry of Power, visited the possible sites and inspected Loch Sloy station.

Closing of Older Power Stations

The Central Electricity Authority has given notice of its intention to close down next year four of the older power stations in Lancashire—Rawtenstall, Wigan, Accrington and Burnley. Mr. E. Butterworth, director of labour and welfare, North West, Merseyside and North Wales Division, has explained to employees the measures which it is hoped to take to minimise inconvenience and expense to them and has promised that alternative employment will be offered in all cases.

Limited redundancy will be created at Bloom Street power station, Manchester, by the change-over to oil firing at that station.

North Eastern Tariffs

The North Eastern Electricity Board has issued separate pamphlets giving details of the new tariffs for various classes of consumers which come into operation on 1st October (see *Electrical Review* 23rd August). The principal tariffs are detailed below:—

Industrial.—Tariff A (annual maximum demand): Fixed charge of 5s per annum per kVA of service or transformer capacity; m.d. charge £6 15s/kW for first 200 kW, £6 10s/kW for next 300, £6 5s/kW for next 500 and £6/kW for additional demand, these charges being increased by 3s/kW for each 0·05 (and *pro rata* for each complete 0·01) by which the average lagging power factor is less than 0·85; "unit" charge scales 0·74d/0·69d/0·615d (l.v.) and 0·7d/0·65d/0·575d (h.v.), subject to fuel cost adjustment of 0·0007d (l.v.) and 0·00065d (h.v.) for each shilling variation in the price of coal from 60s a ton.

Tariff M (monthly maximum demand): Fixed charge of 5d/kVA; m.d. charge scale of 13s 6d/13s/12s 6d/12s; and "unit" charges as for Tariff A.

Commercial.—Tariff C.1 (general purpose block tariff): 5d/2½d/1½d per kWh, the number of kWh in each block depending on installed lighting.

Tariff C.2 (lighting): 5d/kWh for first 1,650 kWh per quarter and 2½d thereafter.

Tariff C.3 (heating, cooking and power): 2½d/kWh for first 2,250 kWh a quarter and 1½d/kWh thereafter. Thermostatically controlled storage water heating, separately metered, 1½d/kWh.

Tariff C.4 (shops, licensed premises and residential hotels): 5d/2½d/1½d per kWh. First block, 15 kWh for each 50 sq ft of "assessed area" up to 10,000 sq ft and for each 100 sq ft in excess of that amount; second block, 22 kWh on a similar basis.

Tariff C.5 (late-hour shop window lighting, permanent advertising and floodlighting): 2½d/kWh for supplies taken from closing time (not before 5 p.m.) until 7 a.m., with time switch rental of 7s 6d a quarter.

Tariff C.6 (commercial maximum demand): Annual demand charge of £10/kW for first 10 kW of m.d., £7 10s/kW for next 90 and £6 10s thereafter, with "unit" charge scale of 0·8d/0·725d/0·65d (l.v.) or 0·76d/0·685d/0·61d (h.v.), subject to fuel clause.

Tariff C.7 (commercial catering where heavy duty electric cooking apparatus is installed): 1¼d/kWh up to 30,000 kWh a quarter and 1d in excess.

Places of Worship.—Tariffs C.1, C.2, and C.3.

Domestic.—Tariff D.1 (quarterly): 5d/kWh for first 10 kWh per assessable room, 2½d/kWh for next 10 kWh and 1d thereafter.

Tariff D.2 (prepayment flat rate): 6d/kWh with 12½% rebate.

Tariff D.3 (prepayment load-rate): 6d/kWh when load does not exceed 400 W and 1½d/kWh when it does, with 7½% rebate.

Farms.—Tariff F.1: Fixed charge, depending on the capital expenditure incurred by the Board, at rate of £1 17s 6d a quarter for each £100; "unit" charge scale 5d/2½d/1d; farmhouse assessed as for Tariff D.1 and farm buildings according to maximum load.

Restricted Hour Supplies:—Tariff RH/1 (applicable to all classes of consumers): 0·85d/kWh between midnight and 7.30 a.m., noon and 3 p.m. and 6 p.m. and midnight, Monday to Friday, and throughout Saturday and Sunday, subject to the supply being provided for thermal storage or other approved use, with a separate circuit.

Street Lighting

Great Yarmouth Highways and Public Lighting Committee has approved a scheme for the installation of sodium lighting in Caister Road between Lawn Avenue and Jellicoe Road. The total cost will be £3,445.

Heston and Isleworth Works and Baths Committee has made provision in the estimates for the current year for improving the lighting of the Great South West Road from Bath Road to the borough boundary. The estimated cost is £3,500.

OVERSEAS

French Participation in Indian Railways Electrification

The French Railways announce that they have concluded an agreement to give technical assistance to the Indian Railways for the electrification of some 600 miles of line carrying heavy traffic in the Calcutta area. The system will be single-phase at industrial frequency. Visits to France by representatives of the Indian Railways convinced their management of the value of this system and the decision taken several months ago to adopt it for the Calcutta area followed a study made by French Railways engineers on the spot.

For a project of such importance involving a new technique of which the Indian Railways have as yet had no experience, technical assistance was essential. In providing technical assistance the French Railways will have the co-operation of the French engineering company "Sofrerail" in whose formation they participated and whose aim is to foster the use of French railway techniques abroad.

The agreement between the French and Indian Railways provides for close co-operation between the two systems which will include the planning of the project itself, the drawing up of specifications, negotiations with and the choice of contractors, the supervision of works, etc. The French Railways also undertake the training of Indian Railways technicians in their engineering departments and on their own work of electrification in France, and to keep their own technicians and those of "Sofrerail" in India for a year after the electrification of each section of line is completed to ensure that the equipment is working satisfactorily and that its maintenance is well organised.

Large Swedish Water Turbine Sets

Water turbine driven generators with a rating of 150,000 kVA each are being manufactured at the A.S.E.A. workshops, Sweden. They are intended for the Swedish State Power Board's 450,000 kVA Stornorrforsen station on the Ume River. The first unit is to be delivered in April next.

The design of the new generators has been based on experience gained in the construction of the three 105,000 kVA units for the Harspranget power station which at present is the biggest hydro-electric plant in Sweden. It has been possible to reduce the weight of the generators in relation to the output and to keep dimensions within reasonable proportions. The total weight of the new generator, including stator, feeder and cooling equipment, is 974 tons and the heaviest single part, the rotor, weighs 515 tons with shaft, compared with 465 tons for the Harspranget rotors.

The turbines are of Francis type and are being built by Nydqvist & Holm, Trollhättan. Their maximum rating is 200,000 h.p. at a head of 73 metres (239½ft). The all-welded runners measure 5·2 metres (17ft) in diameter and weigh 67 tons.

Water Power in Newfoundland

Of the water power resources of Newfoundland the most important is at Hamilton Falls where recent surveys have confirmed that a hydro-electric installation of 4,000,000 h.p. operating at a very high load factor is practicable at a single site 16 miles below the Falls. In addition, there is available downstream a reserve of 2,000,000 h.p. The concession is held by the British Newfoundland Corporation, Ltd. In its report for the year ended 31st March last the company says that steps have been taken to shorten the interval between the time when construction can start (depending on a sufficiently large demand for power) and the date on which production could commence. The first part of an access road 104 miles long has been completed and this summer a detailed survey is being made of the final section of the road from the east bank of the Hamilton River to the proposed site.

Development can be started most economically with a first stage of 1,000,000 h.p., but an initial development less than this would also be a practical possibility. To attract potential consumers a documentary film in colour entitled "Hamilton Power Survey" has been made.

Financial Section

STOCKS and SHARES

AMONG the many points of general interest in Sir Harry Railing's speech at the General Electric Company's annual meeting was his disclosure that advances in wages and salaries granted during the past three years amounted in the case of this group to some £4 million, excluding this year's award. The chairman quoted that figure in speaking of the impossibility of maintaining the trading margins of the previous year, which has been generally apparent throughout the electrical industry. He confirmed that this was a principal factor affecting the results of the year ended last March, for which, although output expanded by 10 per cent, the trading profit was slightly less than before and the net surplus appreciably lower.

G.E.C. Dividend

Referring to the decision to reduce the dividend for 1956–57 from a total of 14 to 12½ per cent, Sir Harry Railing reminded shareholders that the payments applied to capital increased by the issue of some 4½ million new ordinary shares, so that the net amount distributed was in fact larger than before. He also recalled that although the new shares participated in a full year's dividends, the money was in use by the company for only four of the twelve months. Apart from the matter of profit margins, the dividend decision took into account the need for continuous heavy capital expenditure, the results of which might take years to materialise in the shape of production and returns. The accounts show that £3 million of the profits was retained in the form of depreciation provisions and of additions to the reserves.

Price Changes

In very quiet conditions, neither the gilt-edged nor the industrial markets have been displaying any definite tendency. In the former, the seriousness of the latest gold reserve figures seem to have been fully discounted in advance. In the industrial market a sharp rise in the shares of Tube Investments was one of the few features: in anticipation of a new development in the group's plans, the price went quickly from 66s 6d to 70s before partially reacting to 68s 9d. A.E.I. retained most of the improvement induced by the previous week's half-yearly progress report, and the recovery in Plessey was maintained. British Aluminium new shares (now partly paid) fell back to the issue price. British Tabulating Machine new shares were dealt in at a premium of about 12s 3d on the price of 33s at which they are offered to shareholders.

Aerialite

While most of the shares in the accompanying lists are standing well below the top prices recorded earlier in the year, the 1s ordinary shares of Aerialite have lately earned a distinction in rising above their previous best to a figure of 6s 9d. The financial year of the company ended in May, and the results are expected to be declared

Price Changes in

Company or Board	Nom. Value	Middle price 9th Sept.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	71½		3	3	4 4 0	80	71½
Brit. Elec. 1974/77	100	68½		3	3	4 7 6	78½	68½
Brit. Elec. 1976/79	100	72½	−½	3½	3½	4 15 9	81½	72½
Brit. Elec. 1974/79	100	82½		4¼	4¼	5 3 0	92½	82½
Overseas Electric Supply								
Calcutta Elec.	£1	17/6xd		6†	6·8†	7 15 6†	19/-	15/-
East African Power	£1	21/-	+6d	7	7½	7 2 9	21/-	19/-
Nigerian Elec.	£1	17/6		10	10	11 8 6	18/6	17/3
Perak Hydro-Elec.	£1	18/-		10	10*	11 2 3	18/-	13/3
Electrical Shares								
Aberdare Cables	5/-	12/6		17½	17½	7 0 0	12/6	9/9
Aerialite	1/-	6/9	+3d	45	48	7 2 3	6/9	4/9
Allen, W. H.	£1	47/-		10	10	4 5 0	47/3	33/6
Anglo-Portuguese Tel.	£1	24/3		8	8	6 12 0	27/6	20/6
Aron Elec. Ord.	£1	58/9		15	15	5 2 3	60/-	53/6
Assd. Automation	10/-	22/9		5	7½	3 6 0	24/9	17/9
Assoc. Elec. Ord.	£1	62/6xd		15	15	4 16 0	73/-	60/-
Automatic Tel. & El.	£1	73/9xd		15	17	4 12 3	75/-	54/6
Babcock & Wilcox	£1	73/9		15	15	4 1 3	82/6	70/-
Bakelite	10/-	23/3		16	15	6 9 0	24/6	20/9
Baldwin, H. J.	2/-	4/6		20	20	8 17 9	5/-	3/10½
Berry's Electric	5/-	6/6		—	10	7 13 9	6/6	5/6
British Aluminium	£1	56/3	−1/3	12	12	4 5 3	71/3	56/3
Brit. Elec. Traction: Def. Ord. "A"	5/-	24/6		22½	25	5 2 0	25/-	17/-
B.I. Callender's	£1	48/9	−6d	12½	12½	5 2 6	55/-	48/3
B.I. Callender's 6% Pref. ...	£1	19/9		6	6	6 1 6	21/9	19/6
British Tabulating...	£1	46/6xr		9	9	3 17 6	56/3	42/-
British Thermostat	5/-	25/9	+9d	25	25	4 17 0	27/6	25/-
British Vac. Cleaner	5/-	6/-		15	10	8 6 9	8/-	6/-
Brook Motors	10/-	37/6		25	25	6 13 3	37/6	30/-
Brush Group	5/-	7/9		10	Nil	—	8/-	4/6
Bulgin, A. F.	1/-	5/-		50	40*	8 0 0	5/6	4/6
Burco Dean	5/-	13/-		22½	20	7 13 9	14/-	8/9
Cable & Wireless: Ord.	5/-	12/6	+3d	10	10	4 0 0	12/6	9/6
4% Loan	100	91½	+1	4	4	4 7 6	92½	89
Chloride El. Storage "A" ...	£1	67/-	−6d	17½	17½	5 4 6	68/9	58/-
Clarke Chapman	£1	162/6		22½	27½	3 7 9	9	6½
Cole, E. K....	5/-	20/3		17½	17½	4 6 6	23/6	16/6
Cossor, A. C.	5/-	6/9	−3d	Nil	2½	1 17 0	7/3	5/9
Crabtree	10/-	25/6		20	20	7 16 9	26/-	23/3
Crompton Parkinson Ord. ...	5/-	16/6		16	16	4 17 0	17/9	14/6
De La Rue	5/-	25/-	+3d	30	35	7 0 0	24/9	16/3
Decca "A"	4/-	29/3		43¾	43¾	5 19 9	32/3	26/10½
Desoutter	5/-	35/6xd		30	32½	4 11 6	35/6	27/6
Dewhurst	2/-	7/9		30	16½*	4 3 9	7/9	5/9
Dictograph Tel.	2/-	5/6		20	20	—	6/3	5/6
Dubilier Condenser	1/-	6/3		30	30	4 16 0	7/6	5/6
Duport	5/-	20/9		23	25	6 0 6	21/-	17/6
E.M.I.	10/-	34/9	−6d	15	15	4 6 3	36/-	23/9
Electrical Components	5/-	8/-		25	12½*	7 16 3	8/-	6/6
Elec. Construction	£1	25/-		8½	8½	6 16 0	27/6	21/9
Elliott Bros.	5/-	28/9		17½	20	3 9 6	33/6	26/3
Enfield Cable Ord.	£1	16/-	+6d	Nil	Nil	Nil	21/6	13/-
English Electric	£1	61/3		12½	14	4 11 6	65/-	47/6
English Electric 3¾% Pref. ...	£1	12/-		3¾	3¾	6 5 0	14/3	13/-
Ericsson Tel.	5/-	47/6		20†	22†	2 6 3†	50/-	33/3
Ever Ready	5/-	19/-		35	37½	4 18 9*	20/-	15/-
Falk Stadelmann	£1	38/3		17½	17½	9 3 0	40/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

early in November. For each of the two previous years the company has reported a large expansion of earnings and a moderate increase in the dividend. The last payment of 48 per cent came out of earnings equivalent to 118 per cent on the £200,000 ordinary capital, which was supported in the balance-sheet by reserves almost three times as large.

Pye Report

In his review accompanying the Pye company's annual report Mr. C. O. Stanley attributes the reduction in group trading profits, from about £2·7 to £2·1 million, largely to the contraction of profit margins on radio and television sets. As announced previously, the company has passed on to the public none of the wage increases of the past three years. The chairman says that the time is rapidly approaching when this policy will have to be revised. Difficulties have been created too by the effect of the credit squeeze in hindering the provision of capital for the expansion programmes at home and in the Commonwealth. At the meeting on 25th September shareholders will be asked to approve increases in the authorised share capital. Considering this in conjunction with the group's overdraft figure of nearly £3¼ million, the market is prepared to see an issue of new shares sooner or later.

Electrical Investments

Company or Board	Nom. Value	Middle price 9th Sept.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1957 Highest	1957 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	46/3		14	12½	5 8 0	58/9	46/3
G.E.C. 6½ Pref.	£1	20/6		6½	6½	6 6 9	23/6	20/6
General Cables	5/-	15/6		30	30	9 13 6	15/6	11/6
Greenwood & Batley	£1	50/-		17½	17½	7 0 0	50/-	45/3
Hackbridge Holdings	5/-	13/9	−6d	30	20	7 5 6	21/9	13/9
Hackbridge & Hewittic	5/-	13/9		23	20	7 5 6	16/-	13/6
Head Wrightson	£1	135/-		20	22½	3 6 9	146/3	112/6
Heatrae	2/-	4/9		15	15	6 6 6	4/9	4/-
Henley's	10/-	14/9		11½	11½	7 16 0	17/-	14/3
Holophane	5/-	23/9		30	30	6 6 3	26/3	17/-
Hoover	5/-	38/9		50	50	6 9 0	44/-	24/9
I.C.I.	£1	42/-	+9d	10	10	4 15 3	46/6	37/9
Intl. Combustion	5/-	25/6xd		20	22½	4 8 3	30/-	20/-
Johnson & Phillips	£1	25/6	−9d	15	10	7 16 9	34/6	25/6
Lancashire Dynamo	£1	40/-		11	11	5 10 0	45/-	36/9
Laurence, Scott	5/-	17/9		15	15	4 4 6	19/9	13/9
Lister, R. A.	£1	30/-		10	10	6 13 3	33/9	26/9
London Elec. Wire	£1	47/6	−9d	12½	12½	5 5 3	53/9	43/-
Lucas, J.	£1	33/-	−3d	7½	7½	4 11 0	36/6	30/6
Marconi Marine	£1	35/-	−1/6	10	10	5 14 3	37/-	31/-
Marryat & Scott	2/-	12/6		30	35	5 12 0	13/-	8/-
Mather & Platt	£1	58/9		15	15	5 2 3	63/9	51/3
Metal Industries	£1	28/-		Nil	9	6 8 6	30/-	20/3
Midland Elec. Mfg.	£1	52/6		12½	12½	4 15 3	52/6	45/-
Morphy-Richards	4/-	17/6		50	50	4 11 6*	20/-	11/9
Murex	£1	70/3	−1/-	20	20	5 14 0	79/6	65/-
Newman Ind.	2/-	2/9		10	10	7 5 6	2/9	2/1
Oldham & Son	1/-	3/-		17½	17½	5 18 9	3/-	2/3
Parnall (Yate)	5/-	7/6	+6d	12	12	8 0 0	8/9	5/9
Parsons, C. A.	£1	63/9		10	8½*	—	71/3	50/6
Plessey	10/-	76/-	+6d	27½	30	3 19 0	86/3	61/-
Pye "A" Deferred	5/-	18/3	+9d	12½	12½	3 8 6	20/-	15/9
Reyrolle	£1	95/-	−1/-	16¼	17½	3 13 9	110/-	90/-
Rheostatic	4/-	9/-		18½	12½*	5 11 0	10/-	8/9
Richardsons Westgarth	5/-	17/9		16⅝	16⅝	4 14 0	20/-	17/-
Scottish Cables	4/-	18/3	+3d	27½	27½	6 0 6	19/3	15/-
Simon-Carves	5/-	32/6		28¾	20*	3 1 6	36/3	26/-
Smith (England), S.	4/-	15/6	+6d	17½	17½	4 10 3	15/9	13/-
Southern Areas	£1	14/6		7½	7½	10 6 9	20/-	13/9
Strand Elec.	5/-	7/3		15	15	10 6 9	8/-	7/3
Sturtevant	5/-	23/6	+3d	15†	15†	3 3 9†	27/-	22/9
Sun Elec.	£1	43/9		20	25	11 8 6	43/9	43/9
Switchgear & Cowans	5/-	13/-	−6d	25	25	9 12 3	15/6	13/6
Taylor Tunnicliff	5/-	12/9		15	15	5 17 9	13/9	11/9
T.C.C.	10/-	41/3		25	25	6 1 3	41/3	35/-
T.C. & M.	£1	26/6	+6d	8½	8½	6 8 3	31/-	24/6
Telephone Mfg.	5/-	5/9	+3d	10	10	8 14 0	8/-	5/6
Telephone Rentals	5/-	11/6		12½	12½	5 8 9	12/6	10/3
Thompson (John)	5/-	31/9	−3d	25	25	3 18 9	37/-	29/3
Thorn Elec.	5/-	25/-		15	17½	3 10 0	26/3	16/3
Thornycroft	£1	26/3		15	12½	9 10 6	37/6	25/-
Tube Investments	£1	68/9	+2/3	22½	15*‡	4 7 3	70/-	58/3
Vactric	5/-	20/9	+3d	17½	25	6 0 6	23/9	12/9
Veritys	5/-	9/-		12½	12½	6 19 0	9/3	8/-
Walsall Conduits	4/-	13/3		20	20	6 0 9	15/-	11/-
Ward & Goldstone	5/-	29/-		35	40	3 9 0*	29/-	18/6
Watford	2/-	6/6		25	25	7 13 9	6/9	6/3
Westinghouse	£1	37/6		18	9‡	4 16 0	41/3	36/-
West, Allen	5/-	11/9		15	15	—	13/6	9/6
Wolf Electric	5/-	11/-		20	20	4 10 9*	13/9	8/9

British Relay Wireless

Among the numerous interests of the Pye group mentioned in the annual report, the company's investment in British Relay Wireless & Television is described as one which the board expects to go from strength to strength. This company's "B" shares, held by Pye and Murphy Radio, have qualified this year for dividends, and are to be consolidated now with the publicly held 5s "A" shares. The latter have been popular in the market since their introduction four years ago, and are quoted now at 17s 6d, to yield 5½ per cent on the rate of 20 per cent to which the dividend has been raised this year. Development of the business, although hampered by restrictions on its operations and on the raising of capital, has produced a strongly upward trend in trading profits, which reached nearly a million in the twelve months to last April.

Preference Shares

Yields of 6 to 6½ per cent remain freely available from first-grade industrial preference shares. Returns within that range are offered for instance on the 4½ per cent preference shares of Associated Electrical Industries at about 15s and of W. T. Henley's at 14s 6d; on the 7 per cent issues of Ferranti at 21s 6d and of Ericsson Telephone at 22s 3d; on G.E.C. 6½ per cents at 21s, and Babcock & Wilcox 4 per cents at 12s 6d. Among preference shares recently on offer to yield 7 per cent or more are Anglo-Portuguese Telephone "sixes" at 17s, Christy Bros. "fives" at 14s, Johnson & Phillips redeemable 4½ per cents at 12s 9d, and J. Scott 6½ per cents at 18s.

Increases of Capital

Albert Taylor (Manchester), Ltd.—Increased by £20,000, in £1 ordinary shares, beyond the registered capital of £5,000.

Fielden Electronics, Ltd.—Increased by £30,000, in £1 ordinary shares, beyond the registered capital of £60,000.

REPORTS and DIVIDENDS

The General Electric Co., Ltd.—Before reviewing the company's activities during the past year at the annual meeting held on 5th September, Sir Harry Railing (chairman and joint managing director) referred to the retirement from the board of Mr. F. Winstanley and the appointment as a director of Sir Toby Low. As we report elsewhere in this issue Mr. Winstanley will continue to fulfil his managerial responsibilities until the end of the financial year when he will have completed sixty years' service with the company.

In commenting on the accounts for 1956-57, Sir Harry emphasised the impossibility of maintaining the trading margins of the previous year which had been generally apparent throughout the electrical industry. The main reason was the failure to stem inflation and to cope with the unceasing demands for wage increases, which during the last three years cost the G.E.C. alone some £4 million. Added to the trading difficulties were the credit restrictions, the increase in purchase tax and rising competition from other countries with lower taxation, lower wages or easier credit facilities. In the export of consumer goods they also had to face import restrictions, the progressive development of local manufacture in Australia, India and South Africa and the consequent necessity to extend their local manufacture which could only gradually be made to pay. It was more than ever essential that they should keep their lead in the new fields which were based on their research, technical skill and engineering experience.

The expansion of the G.E.C. continued last year; a further £2 million was spent on plant and machinery, and another 380,000 sq ft of floor space was added. Dealing with research, Sir Harry said that Wembley Research Laboratories, the Stanmore Applied Electronics Laboratories and the research departments attached to the various manufacturing units continued to contribute to the technical excellence of their products.

They were taking a leading part in the nuclear power programme and an order had been received from the South of Scotland Electricity Board for their first complete atomic power station. A strong atomic energy group with all its equipment for research development had been built up and there was every indication that their endeavours would lead to further reduction in the cost of nuclear power.

Turning to the heavy engineering side of the business, Sir Harry said that the output of turbo-alternators last year totalled 500 MW, the highest in the company's history, and among the orders received was one for a 15 MW turbo-alternator for the Dounreay station. The output of transformers, switchgear, rectifiers, mining and industrial equipment and of marine and aeronautical equipment had been satisfactory. Mercury arc rectifier plant installed at home totalled 38,000 kW of which 27,500 kW was for the frequency conversion scheme of the Southern Region of British Railways. They had now been entrusted with the order for 85,000 kW of similar rectifier substations for the Kent coast lines. On the traction side and for railway signalling equipment, large orders had been received for the railway modernisation scheme.

In telecommunications and electronics, the company's contribution was growing with the expansion of production facilities, and a wide range of equipment was being produced. New developments included, on the radio transmission side, a new microwave multi-channel telephone system with a performance far superior to that of existing designs. Sales of "Osram" lamps had again increased and they retained their lead in the home market; export sales had also risen. Home and export demand for their street and airfield lighting equipment continued satisfactorily.

In the field of domestic appliance manufacture, the risks had not been eased by the Government in the 1957 budget. He hoped that a revision of the purchase tax structure would not be delayed too long. In his view, too much had been made of the ill effects of home appliance sales on the diversion of productive resources, raw materials and labour. Some easing of the present restrictions, at least on labour-saving devices, was definitely overdue. The company had suffered from the general trend of lower sales, but towards the end of the year, and since, sales had shown some improvement.

Sir Harry said that there had been progress in all the subsidiary companies, and among their associated companies the expansion of the works of Pirelli-General Cable Works, Ltd., had continued. The demand for cables of all types continued and was likely to be maintained by the railway modernisation scheme, coupled with the transmission and distribution programme for electricity in this country and the rapid extension in the use of electrical energy abroad.

Turning to overseas activities, Sir Harry reported that last year's exports were the highest in the history of the company. Exports rose by 26 per cent, against 14·8 per cent for the previous year. Manufacturing plants overseas continued to expand. This was due, partly, to the intensive programme of industrial development abroad and partly to the tightening up of embargoes, quotas, and licences on an increasing range of imports.

Reviewing the outlook for the electrical industry generally, the chairman said that it was on the threshold of further expansion. We must not think that the nuclear power programme by itself would solve our energy problem; it would only supplement the growing fuel needs of our expanding industrial economy. Only the electrical manufacturing industry could hope to bring about a greater world-wide utilisation of energy resources, the most direct and immediate way to help underdeveloped nations, and thus help to secure peace in the world. On the question of immediate and future profitability, Sir Harry said that the great aim must be to counteract the shrinkage in margins first by reducing production costs through more economic design, less costly materials and more economic production methods, and second by a larger volume of sales. This process was to-day going on relentlessly in every field of electrical industry. Profitability was indispensable for any essential industry. It was incredible that this was not yet universally understood and accepted, especially by the rank and file of labour.

As to the Restrictive Trade Practices Act, Sir Harry said that the various sections of the industry, before the Act came into force, had consistently removed practices which might be held to be against the public interest. He warned against the wrong interpretation of "public interest" and said that if it were held that the cheapest possible price and the smallest possible profit margin in each section of the industry were in the best interest of the purchasing bodies and of the consumers, it would be impossible to keep up the effort essential for research, engineering development and modernisation. Sir Harry briefly referred to the company's efforts in education and training and to its scheme of university scholarships.

The company has issued a well-illustrated booklet on atomic power achievements in which it details the part which it is playing in the development of atomic energy.

Efco, Ltd.—In his review of the group's activities during the year ended 31st March last, Mr. D. F. Campbell (chairman) says that the advent of atomic power and supersonic speeds of aeroplanes and guided missiles has opened an entirely new field of metallurgy in which many types of electric furnaces are essential for the production of the new metals. On the road to atomic energy there are many alternative ways and it is not yet well determined which of the various "new" metals are likely to be in greater or less demand. For this reason, the metallurgical staff is being strengthened by the appointment of additional men experienced in the most modern techniques.

A company, Efco-Edwards Vacuum Metallurgy, Ltd., has been formed to

combine the knowledge and skill of the two participating companies in the field of melting and heat treatment of steel and other metals by processes which are bound to be applied to an ever-increasing extent in the "new metallurgy" on which the future of atomic power stations so largely depends.

Arrangements have recently been made for technical collaboration with the leading arc furnace makers in the United States, Germany and France, and two contracts for the sale of drawings and technical information have recently been finally concluded with leading makers of steel products in France and Japan. The Electric Resistance Furnace Co., Ltd., has had a successful year.

The electric furnace division has been strengthened by the acquisition of a 51 per cent interest in Royce Electric Furnaces, Ltd., a business in which they already held a 49 per cent interest. The work of the Efco group at the end of the financial year was higher in value and volume than in any previous year and included several orders for special equipment similar to that used in the construction of Calder Hall.

The Calcutta Electric Supply Corporation, Ltd.—The accounts for the fifteen months ended 31st March last show a total revenue of £8,101,785. To conform with the Indian Government regulations, the accounting period is now made up to the end of March instead of December as formerly. For the year ended 31st December, 1955, the total revenue was £5,859,483. The net revenue for the fifteen months, after meeting working costs, etc., was £2,193,878 (against £1,525,226 for the previous accounting period), to which is added £136,163 brought in, making £2,330,041. After providing for debenture interest, taxation and other charges, and making special appropriations, it is proposed to pay a final ordinary dividend of 2½ per cent, which with the two interim dividends each of 3 per cent already paid, makes the total distribution for the fifteen months 8½ per cent, equivalent to a rate of 6⅓ per cent per annum. The balance carried forward is £130,008.

In his circulated statement, Sir Harry Burn (chairman) says that in order to make available comparisons in respect of kWh sold, figures have been extracted covering the corresponding period of 1955-56. The sale of electricity during the year under review was 1,710 million kWh, an increase of 152 million. Sales for h.v. industrial power purposes totalled 1,029 million kWh (942 million), the jute mills, paper mills, steel works and rolling mills, engineering workshops and chemical works accounting for the major part of this increase. The demand for l.v. industrial power reflects the increasing activities of small workshops and factories, sales for 1956-57 being 106 million kWh (against 99 million kWh for 1955-56). Restriction of imports designed to foster indigenous industries has led to expansions in this particular field.

The ordinary domestic and commercial load at the flat rate increased from 226 million kWh in 1955-56 to 241 million kWh in 1956-57. Public lighting shows a steady increase and there has been a marked increase in the demand for bulk supplies from distributing undertakings. The special tariff under which it made available to owners of large buildings electricity at high voltage for conversion by them to l.v. has attracted new consumers and sales under this tariff amounted to 52 million kWh, an increase of 5 million kWh over the 1955-56 figure. In June this year the Damodar Valley Corporation grid substation in Howrah was opened. This interconnection with the system will make available within a period of less than three years 100,000 kVA of power.

The Telegraph Condenser Co., Ltd., has declared an interim dividend of 5 per cent (unchanged). The directors state that the turnover for the half year to 30th June last was substantially at the same level as that for the equivalent period in 1956 and profits subject to taxation total £173,879. This compares with £162,412 for the six months to 30th June, 1956. Output is being maintained at a satisfactory level.

James Howden & Co., Ltd.—The main figures in the accounts for the year to 30th April last were given in our last issue. In his statement, which has been circulated with the report and accounts, Mr. C. W. Hume (chairman), says that the output for the year was a record. The expansion of the company's activities, new buildings and equipment have been financed almost entirely out of profits retained in the business, and as a result of this policy, production in the Scottish factories has increased steadily during recent years. Nevertheless, orders accumulate and it is felt that additional steps are necessary to increase the capacity of factories still further. In Scotland Street the purchase and integration into the factory of premises previously owned by Glasgow Corporation and rented by the company will enable these premises to be re-arranged and re-equipped as a permanent part of the factory.

A subsidiary company has been formed in Canada and a site purchased at Scarborough, Ontario, where a factory is now being built which should be in operation next year. Until recently power in Canada has been provided mainly by hydro-electric stations, but now to satisfy the increasing power demand an extensive programme of thermal power stations is being put in hand and they have already secured important orders for their products as part of this programme. In South Africa too, the work coming in and the orders on hand have increased to such an extent that the factory facilities there require extension. The present expansion programme necessitates the use of additional funds and the chairman refers to the proposed "rights" issue of 546,000 ordinary shares of 10s each, reported in our last issue.

Permali, Ltd.—In connection with the rights issue of 1,040,000 ordinary shares of 2s each at 3s 6d per share, rights taken up by members totalled 883,975. Supplementary applications were received for a total of 236,010 excess shares. Applications for up to 1,000 shares will be allotted in full and larger applications have been scaled down.

A. Reyrolle & Co., Ltd., have declared an interim dividend of 6½ per cent (unchanged) on increased capital.

Aberdare Cables (Holdings), Ltd., has declared an interim dividend of 7½ per cent (same).

New Companies

Hawker Siddeley John Brown Nuclear Construction, Ltd.—Registered 2nd September. Capital £500,000. To exploit all matters connected with the production and use of nuclear power, etc. Solicitors: Roney & Co., 42-45, New Broad Street, E.C.2, and Simmons & Simmons, 1, Threadneedle Street, E.C.2.

C. R. Woollard, Ltd.—Registered 30th July. Capital £1,000. To acquire the business now carried on by C. R. Woollard as C. R. Woollard & Co., and to carry on the business of electrical contractors, electricians and electrical engineers, etc. Directors: C. R. Woollard and R. R. Woollard. Solicitors: Maxwell Batley & Co., 65, London Wall, E.C.2.

Steve Stephens, Ltd. — Registered 9th August. Capital £1,000. Television manufacturers, wholesalers and retailers, manufacturers of and dealers in electronic equipment, etc. First directors: O. C. Stephens (secretary) and Maud Stephens. Regd. office: 16, John Dalton Street, Manchester, 2.

Liquidations

A. D. Camp, Ltd., electrical contractors, 42, Oldham Road, Failsworth, Lancs.—Winding up voluntarily. Liquidator, Mr. L. H. Shipton, c/o Poppleton & Appleby, 31, Lloyd Street, Manchester, 2, appointed 28th August.

Webcor (Great Britain), Ltd., radio manufacturers, 1-2, Great Winchester Street, London, E.C.2.—Winding up voluntarily. Liquidator, Mr. L. H. Graves, 1-2, Great Winchester Street, London, E.C.2, appointed 30th August.

Bankruptcies

P. J. Elworthy, 128, Cowick Street, St. Thomas, Exeter, radio, television and electrical engineer.—Receiving order made 23rd August on debtor's own petition. Public examination 15th October at the Castle, Exeter.

E. Webb, lately carrying on business at 10, Alderley Street, Macclesfield, Ches., as an agent for electrical appliances.—Receiving order made 28th August on debtor's own petition.

N. Sherman and **B. Bercovici,** lately trading together as B.B. Radio and Television Service and B.B. Radio, at 168, Roman Road, London, E.2, radio, television and electrical equipment dealers.—Trustee, Mr. A. W. Hunter, Walter House, 418-422, Strand, London, W.C.2, appointed 26th August.

F. Kent, 397, High Street, Lincoln, trading as Lincoln Factoring Co., electrical wholesaler.—Trustee, Mr. E. C. Stimpson, 27, Regent Street, Park Row, Nottingham, Official Receiver, released 29th August.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 18th September from the Patent Office, 25, Southampton Buildings, London, W.C.2

1951

15403. Aron Electricity Meter, Ltd., and Riordan, E. J.—Electromagnetic driving devices operated by electric impulses. 25th June, 1952. (783267.)

1953

2109. Electric & Musical Industries, Ltd. —Electron discharge devices. 25th January, 1954. (783161.) 4639. Electron discharge devices employing photo-conductive target electrodes. 3rd February, 1954. (783162.)

26729. Krawinkel, G. H.—Electronic switches. 29th September, 1953. (782972.)

29353. Igranic Electric Co., Ltd.—Control systems for electric motors. 23rd October, 1953. (783176.)

34534. Soc. Asservelec.—System of telecommunication. 11th December, 1953. (783089.)

1954

1732. General Electric Co.—Control means for clothes washers. 20th January, 1954. (782976.)

5578. Metropolitan-Vickers Electrical Co., Ltd.—Electrical resistance heating apparatus. 24th May, 1955. (783261.)

5781. Baso, Inc., formerly Milwaukee Gas Specialty Co.—Electrical control apparatus. 26th February, 1954. (783272.)

8602. General Electric Co., Ltd., Holliday, J. H., and Machin, C. F.—Electric arc convertors. 25th February, 1955. (783263.)

8603. General Electric Co., Ltd., and Holliday, J. H.—Vapour electric arc convertors. 25th February, 1955. (783264.)

12862. Painton & Co., Ltd.—Rod-type electrical resistor elements having end caps and electrical wire tail connection leads. 29th April, 1955. (783093.)

20187. Siemens Bros. & Co., Ltd.—Incandescent electric lamps. 8th July, 1955. (783278.)

22017. United Kingdom Atomic Energy Authority.—Support devices for use in nuclear reactors. 27th July, 1955. (783094.)

23070. E.M.P. Electric, Ltd.—Lightning arrestors for electric power lines. 29th June, 1955. (782902.)

23371. M-O Valve Co., Ltd.—Magnetrons. 11th August, 1955. (Addition to 744788.) (783079.)

23565. Igranic Electric Co., Ltd.—Timing devices employing thermionic valves. 13th August, 1954. (783282.)

28678. Singleton, S. A.—Immersion heaters. 20th September, 1955. (783097.)

28914. Cinema-Television, Ltd. —Cathode-ray tube apparatus. 7th October, 1955. (783185.)

30040. E.M.P. Electric, Ltd.—Electric surge and lightning arrestors. 13th October, 1955. (783098.)

30392. Brentford Transformers, Ltd.—Electrical boosters. 18th October, 1955. (782988.)

31835. General Electric Co., Ltd., and Beesley, J. H.—Electrical signal gating circuits. 27th October, 1955. (782910.)

34170. Westinghouse Electric International Co.—Washing apparatus for electrostatic precipitators. 25th November, 1954. (783290.)

34374. Edison Swan Electric Co., Ltd.—Socket holders for thermionic valves. 25th November, 1955. (783291.)

34970. British Thomson-Houston Co., Ltd.—Digital computing apparatus. 30th November, 1955. (783102.)

35511. National Research Development Corporation.—Manufacture of electronic circuit elements. 9th January, 1956. (782918.)

35736. M-O Valve Co., Ltd.—Magnetrons. 9th December, 1955. (Addition to 744788.) (783080.)

36075. United Kingdom Atomic Energy Authority.—Moderator and reflector structures for nuclear reactors. 6th December, 1955. (782922.)

36215. Burndept, Ltd.—Electrodes for dry cells. 14th December, 1955. (783293.)

1955

45. English Electric Valve Co., Ltd.—Indirectly heated cathode structures for magnetrons. 12th September, 1955. (783294.)

100. British Thomson-Houston Co., Ltd. —Arc-chutes for electric circuit-breakers. 29th March, 1956. (783103.)

1903. Henley's Telegraph Works Co., Ltd., W. T.—Electrical fuse holders. 4th January, 1956. (Addition to 712532.) (783106.)

2106. British Insulated Callender's Cables, Ltd.—Extrusion of rubber compounds. 24th January, 1956. (783107.)

3722. General Electric Co., Ltd.—Winders. 1st February, 1956. (783298.)

4296. Fernseh Ges.—Television apparatus. 14th February, 1955. (782929.)

6450. Standard Telephones & Cables, Ltd.—Electrical circuits employing gaseous discharge tubes. 4th March, 1955. (Addition to 663574.) (783000.)

8454. Philips Electrical Industries, Ltd.—Phase-difference detectors and frequency demodulators. 23rd March, 1955. (783304.)

9427. Philips Electrical Industries, Ltd.—Asymmetrically conductive devices. 31st March, 1955. (783119.)

9762. Philips Electrical Industries, Ltd.—Cathode-ray tubes for reproducing coloured television images. 4th April, 1955. (783305.)

9819. Beckman Instruments, Inc.—Method and apparatus for welding filaments or wires. 4th April, 1955. (782938.)

9830. Mechanical Products, Inc.—Automatic electric circuit-breakers. 4th April, 1955. (783004.)

9960. General Electric Co.—Control systems for reaction power plants having variable exhaust area. 5th April, 1955. (783120.)

10047. Pirelli-General Cable Works, Ltd. —Devices for use in jointing oil-filled electric cables. 26th January, 1956. (783307.)

10263. Standard Telephones & Cables, Ltd.—Combined telephone and dictation system. 7th April, 1955. (783122.)

11826. Marconi's Wireless Telegraph Co., Ltd.—Electron discharge device circuit arrangements. 17th January, 1956. (783124.)

13870. Widakowich, M.—Commutation of contact convertors. 13th May, 1955. (783209.)

14029. Lucas (Industries), Ltd., J.—Commutators for dynamo-electric machines, or other electrical apparatus. 3rd May, 1956. (783210.)

15128. General Electric Co.—Mass spectrometers. 25th May, 1955. (783211.)

15767. Sperry Corporation.—Ultra-high-frequency energy switch. 1st June, 1955. (783213.)

16282. Etablissements C. Testut.—Electrical load weighing apparatus. 7th June, 1955. (783214.)

16585. Ranco, Inc.—Electric snap-switch mechanism. 9th June, 1955. (783014.)

16757. Aktiebolaget Tudor.—Electric accumulator cells. 10th June, 1955. (783320.)

19052. Hollander, J. M.—Electrical distribution means. 3rd May, 1956. (782946.)

19835. Sperry Rand Corporation.—Automatic frequency control system. 8th July, 1955. (783133.)

22648. Sangamo Weston, Ltd.—Electrical instruments of the magnetic core type. 5th August, 1955. (783136.)

24767. Etablissements E. Jaeger.—Movements for electric timepieces. 29th August, 1955. (782954.)

27638. Philco Corporation.—Colour television apparatus. 28th September, 1955. (783143.)

27853. Akt.-Ges. Brown, Boveri & Cie.—Revolving field for electrical machines with salient poles. 30th September, 1955. (782958.)

28384. Philips Electrical Industries, Ltd. —Ferromagnetic core arrangements. 5th October, 1955. (783032.)

29299. Penberthy, H. L.—Electrode assembly for glass furnaces. 14th October, 1955. (783145.)

30780. Canadian General Electric Co., Ltd.—Detector arrangements for frequency or phase modulated carrier waves. 27th October, 1955. (783148.)

31596. Standard Telephones & Cables, Ltd.—Computing apparatus. 4th November, 1955. (783229.)

32305. Philips Electrical Industries, Ltd. —Television cameras. 11th November, 1955. (783040.)

32742. National Cash Register Co.—Circuitry for generating the logical inverse of binary signals. 16th November, 1955. (783041.)

33039. Sperry Rand Corporation.—Inductive phase shifter. 18th November, 1955. (783149.)

33623. Papalia, M.—Telephone handset with extensions for providing privacy to the user. 23rd November, 1955. (782966.)

33795. Westinghouse Electric International Co.—Electrical two-part connector devices. 25th November, 1955. (783152.)

36158. Philips Electrical Industries, Ltd. —Methods of manufacturing permanent magnets and permanent magnets manufactured by carrying out these methods. 16th December, 1955. (783237.)

37276. Philips Electrical Industries, Ltd. (Naamloze Vennotschap Philips' Gloeilampenfabrieken).—Transistor mixing circuit arrangements. 29th December, 1955. (783238.)

1956

2131. Allmänna Svenska Elektriska Aktiebolaget.—Extinguishing chamber for an oil-blast electric circuit-breaker. 23rd January, 1956. (783241.)

3255. General Electric Co.—Brush holders for electrical equipment. 1st February, 1956. (783084.) 3256. Electrical equipment. 1st February, 1956. (783085.)

6900. Siemens-Schuckertwerke Akt.-Ges. —Electric contact convertors. 5th March, 1956. (783057.)

8041. Naamlooze Vennootschap Nederlandsche Kabelfabriek.—Manufacture of electric communication cables. 14th March, 1956. (783064.)

9322. Dictaphone Corporation.—Electric motors. 26th March, 1956. (783249.)

11303. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines et Gaz.—Vibrating reed relays. 13th April, 1956. (783252.)

13905. Siemens & Halske Akt.-Ges.—Tuning-fork relays. 4th May, 1956. (783255.)

16115. General Electric Co.—Dual voltage a.c. motors. 24th May, 1956. (783259.)

25045. Electric & Musical Industries, Ltd.—Electron discharge devices and circuit arrangements embodying such devices. 25th January, 1954. (783163.) 25046. Electron discharge devices employing photo-conductive target electrodes. 3rd February, 1954. (Divided out of 783162.) (783164.)

1957

13398. Metropolitan-Vickers Electrical Co., Ltd.—Electrical resistance heating apparatus. 24th May, 1955. (Divided out of 783261.) (783262.)

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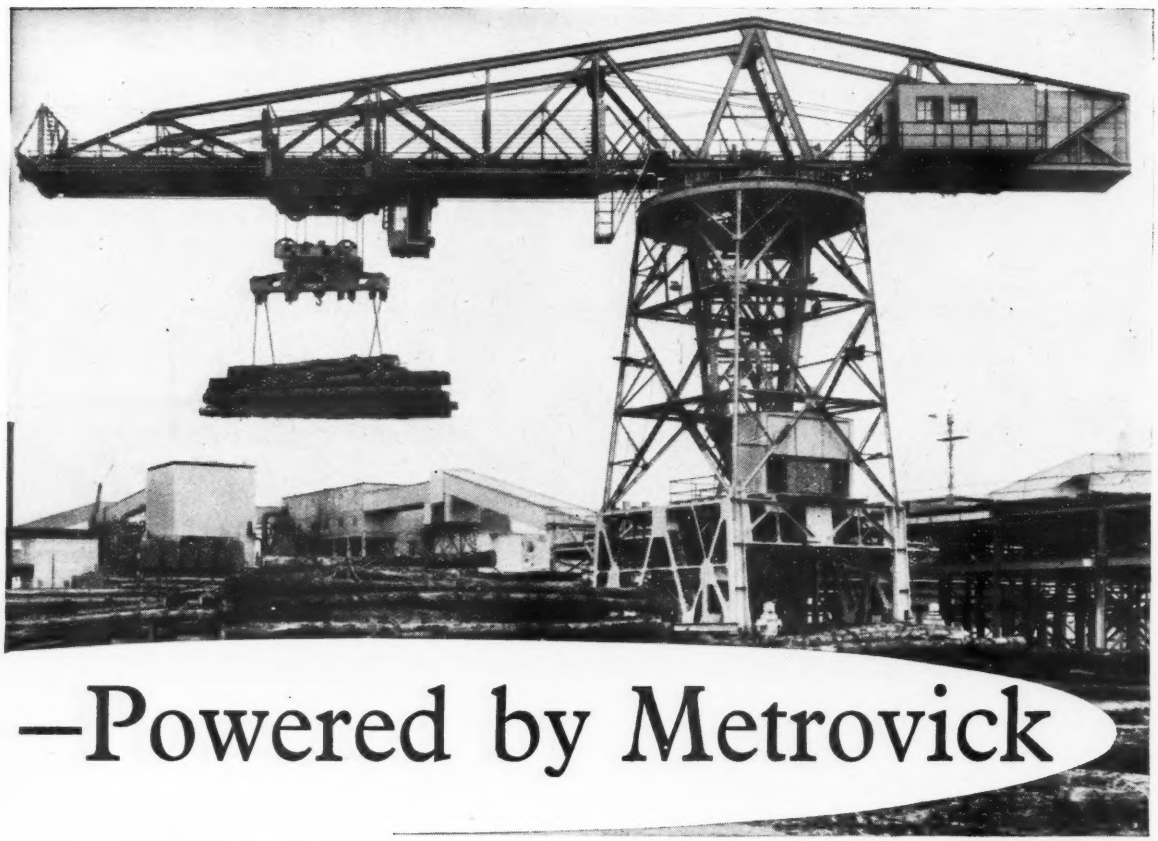

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CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Antrim.—County Education Committee. 25th September. Electrical installation in new primary school, Seymour Hill, Dunmurry. McAuslan & Abbot, consulting engineers, 16, Bedford Street, Belfast.

Armagh.—County Education Committee. 24th September. Electrical installation in Ahorey county primary school, Portadown. G. D. Taylor, architect, 27a, English Street, Armagh.

Australia.—Electricity Trust of South Australia, Adelaide. 19th November. Water treatment plant. (See this issue.)

Electricity Commission of New South Wales, Sydney. 30th September. Self-cleaning circulating water screening plant. (E.S.B. 21163/57. Ten/27835.)* 1st November. Control grading rings for use on 330 kV transmission lines. (See this issue.)

Director of Stores and Contracts, Postmaster-General's Department, Melbourne. 29th October. Mechanics' tools, gauges, etc. 31st October. Mechanics' tools for exchange and substation maintenance, and loading coils in cases. (E.S.B. 21361-3/57. Ten/27851.)*

Bournemouth.—Corporation. 5th October. Street lighting equipment. (See this issue.)

Fermanagh.—County Education Committee. 23rd September. Electrical installation in new secondary intermediate school, Lisnaskea. William J. Ogle, consulting engineer, 63, Main Street, Bangor, Co. Down.

Glanford Brigg.—R.D.C. 12th October. Sludge pump and sewage ejectors, complete with motors, compressors, etc., for Burton Stather sewerage scheme. John H. Haiste & Partners, consulting engineers, Belmont House, 20, Wood Lane, Headingley, Leeds, 6.

India.—Stores Purchase Committee, Bangalore. Workshop equipment for the Sharavathi Valley hydro-electric project, including d.c. and a.c. welding sets, electric hammer and electric blower. (E.S.B. 21673/57. Ten/27863.)*

Damodar Valley Corporation, Calcutta. Lead acid type storage battery and battery charging equipment for Panchet Hill hydro-electric power station. (E.S.B. 21409/57. Ten/27883.)*

Lancashire.—The County Council announces that its standard specification of electrical installations is being revised and as from 1st October tenders for electrical work will be invited in accordance with the revised specification. (See this issue.)

Malta.—Maltese Government. 10th October. One 4 MVA auto-transformer. (See this issue.)

Manchester.—City Council. 30th September. Bollard and transport batteries, calcium chloride solution, etc., for the year ending 31st December, 1958. City surveyor, Town Hall, 2.

New Zealand.—Invercargill Electricity Department. 7th October. Three 750 kVA transformers. (E.S.B. 21287/57. Ten/27776.)*

Norwich.—Corporation. 28th September. Street lighting equipment. (See this issue.)

Oban.—Corporation. 5th October. Street lighting equipment. (See this issue.)

Offaly.—Vocational Education Committee. 24th September. Electrical installation at the new vocational school, Edenderry. J. V. Tierney & Co., consulting engineers, 15-16, Duke Street, Dublin.

Pakistan.—Pakistan Development Corporation, Karachi. 30th September. Galvanised pipe, four 150 kW diesel generating sets, distribution panels, transmission line, armoured cable and air compressor. (E.S.B. 21515/57. I.C.A. Ten/27823.)*

Rochford.—R.D.C. 26th September. Fluorescent lighting in ground floor offices, Council Offices. Surveyor, Council Offices, 24, South Street, Rochford, Essex.

South Africa.—Stores Department, South African Railways, Johannesburg. 27th September. (a) cable and copper wire; (b) electric cable; (c) nine 35 kW and nine 50 kW diesel driven generating sets and six portable petrol electric generating sets; (d) copper and contactor wire. (E.S.B. 21041/57 (a), E.S.B. 21042/57 (b), E.S.B. 21043/57 (c) and E.S.B. 21045/57 (d). Ten/27722-25.)* 2nd October. Air break disconnecting switches. (E.S.B. 21703/57. Ten/27866.)* Motors and control equipment for 5-ton overhead electric travelling crane. (E.S.B. 21702/57. Ten/27868.)*

Union Tender and Supplies Board, Pretoria. 26th September. Electric furnace. (E.S.B. 21079/57. Ten/27751.)*

Thailand.—Naval Quartermaster General's Department, Bangkok. 16th October. Two 32 kVA diesel generating sets. (E.S.B. 21240/57. Ten/27834.)*

Uruguay.—Administracion General de las Usinas Electricas y los Telefonos del Estado. 10th October. Condenser tubes and threaded collars. (E.S.B. 20807/57. Ten/27780.)* 16th October. Armoured cables. (E.S.B. 21552/57. Ten/27856.)* 17th October. Bare copper cables and accessories. (E.S.B. 21555/57. Ten/27858.)* 22nd October. Insulated copper wire. (E.S.B. 21554/57. Ten/27857.)*

Wolverhampton.—Borough Council. 28th September. Electrical equipment (Form No. 5) for Home for Aged Persons, Park House, Amos Lane, Wednesfield. Chief welfare officer, 183, Stafford Street.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Cardiff.—Corporation. Electrical installation works at Gladstone School (£2,239).—E. J. Honeybun.

Carlisle.—Highways and Streets Committee. Recommended. Mercury vapour lighting in London Road, Dalston Road, Shaddongate, Warwick Road and Moorhouse Road (£7,639).—G.E.C.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Barnstaple.—Houses (54), Zephyr estate; borough architect.

Basildon.—Houses, South Green, Billericay (66) and Devonshire Road, Laindon (32); U.D.C. surveyor, 108, High Street, Billericay.

Bexley.—Community centre, Wrotham Road, and reference library and administrative centre, Townley Road; borough engineer, Council Offices, Bexleyheath, Kent.

Blackpool.—Sales depot, offices, cold storage and garage, Cornford Road; J. H. Dewhurst, Ltd., 14, West Smithfield, London, E.C.1.

Bootle.—Shops (16) and maisonnettes (24), Park Lane; borough surveyor.

Border.—Houses (55), Longtown, for R.D.C.; housing architect, 5, Victoria Place, Carlisle.

Bradford.—Block of shops and offices, Bridge Street/Market Street site; Bernard Engle, architect, 8, New Square, London, W.C.2.

Brighton.—Three-storey blocks of flats (72), Whitehawk estate; D. J. Howe, borough engineer, 26/30, King's Road.

Buxton.—Factory estate, Tongue Lane; Southport & District Factory Estates, Ltd., 30, Stanley Street, Southport.

Chadderton.—Secondary school, Butterworth Lane; G. & J. Seddon, Ltd., builders, Coronation Buildings, Walkden.

Chatham.—Showrooms and offices, High Street; Joseph Richardson, Ltd., builders, 38, Upper Grosvenor Street, London, W.1.

Cheltenham.—Factory extension; Spirax-Sarco, Ltd., Charlton House, Cirencester Road.

Chichester.—Houses (68), Parklands site; borough engineer, North Street.

Corby.—Maternity unit for Corby Hospital; Gotch, Saunders & Surridge, architects, 38, High Street.

Coseley.—Houses (190), Wallbrook; Joseph Webb & Co., Ltd., builders, 1, Ivy House Lane, Coseley, Staffs.

Coventry.—Municipal café (£18,850); A. G. Ling, city architect.

Crawcrook (Co. Durham).—R.C. church; J. & W. Lowry, builders, 64, Bath Lane, Newcastle-on-Tyne.

Dagenham. — Administration block, Research Institute; May & Baker, Ltd., Rainham Road South.

Office block and boiler house; Stent Precast Concrete Co., Ltd., Chequers Lane.

Doncaster.—Flats, Wheatley Park estate (£154,980); borough architect.

Ealing.—Houses (146), Northolt Park and Lime Trees estates, and flats (21), Dabbs Hill Lane; borough engineer, Town Hall, Ealing, W.5.

Eccles.—Two blocks of flats, Trafford Road; Frank Bradley, architect, 4, Wood Street, Bolton.

Enfield.—Primary school, Manor Farm; A. Scott & Sons, Ltd., builders, 5, Beechdale, London, N.21.

Gateshead.—Factory for W. & T. Avery, Ltd.; Marshall & Tweedy, architects, 36, Blackett Street, Newcastle-on-Tyne.

Gosforth. — County modern school (£120,000); county architect, County Hall, Newcastle-on-Tyne.

Great Yarmouth.—Theatre, Britannia Pier (£100,000); H. Holmes & Son, Ltd., builders, South Ice House Hill, Gorleston.

Hindley.—Cardinal Newman R.C. Secondary School (£142,712); G. & J. Seddon, Ltd., builders, Little Hulton, Walkden, Manchester.

Jarrow.—Extensions to grammar school (£156,987); George Bainbridge, 205, Westgate Road, Newcastle-on-Tyne.

Loftus.—Houses (150), Easington, for U.D.C.; W. C. Ranson.

London.—Hall and offices, Basinghall Avenue, E.C.; The Girdlers Company, 22, St. Andrew Street, E.C.4.

Casualty and outpatient departments, Neasden, for Central Middlesex Hospital; E. Wingfield-Bowles & Partners, consulting engineers, 32, Old Queen Street, S.W.1.

Luton.—Houses (80), as first stage development of Barton housing estate; H. C. Janes, Ltd., 189, High Town Road, Luton.

Newport.—Secondary school, Hartridge site; Lucas & Pyke, electrical consultants, 25, Caxton Street, London, S.W.1.

Newton Abbot.—Building for students at Seale Hayne College (£60,000); Soper & Ayers, builders, Magdalen Street, Exeter.

North Shields.—Extensions to factory for Thomas De La Rue, Ltd.; T. Bedford, consulting engineer, 41, New Bond Street, London, W.1.

Northumberland.—Old people's home at Cowpen (£35,000); C. C. Brown, county architect, County Hall, Newcastle-on-Tyne.

Reading.—Factory and offices, Basingstoke Road; Bradley & Bliss, manufacturing chemists, 6, London Street.

Ripley.—Old people's hostel on site adjacent to Ripley Hospital (£35,000); county architect, St. Mary's Gate, Derby.

Rossendale.—Extensions to workshops, assembly hall and five-storey classroom block, as further stage of Rossendale College of Further Education; Lancs county architect, P.O. Box 26, County Hall, Preston.

Salisbury. — Houses (42), Bishopdown estate; city engineer, Council House, Bourne Hill.

Sedgefield.—Houses (70), Chilton and Trimdon Village, for R.D.C.; Bell & Ridley, Ltd., builders, North Road, Durham.

Stoke-on-Trent.—Factory, offices, laboratory and canteen; Robert Hyde & Son, Ltd., North Stafford Steel Foundry.

Wakefield.—Central offices and laboratories, Mark Lane; Edward Sutcliffe, Ltd., Station Road, Mirfield.

Washington (Co. Durham).—Houses (87); U.D.C. surveyor.

Wednesfield.—Houses (62), Nechells Lane estate; T. A. Peacock, U.D.C. surveyor, 29, Bolton Road, Wednesfield, near Wolverhampton.

Wembley.—Office block, Empire Way; E. J. Lacy & Co., Ltd., Steele Road, London, N.W.10.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 16th September

BIRMINGHAM.—Grand Hotel, 6.15 p.m. Birmingham Electric Club. Presidential address by J. Clement.

Tuesday, 17th September

COVENTRY.—Hotel Leofric, 7.30 p.m. Incorporated Plant Engineers, Birmingham Branch. "Titanium as a Material of Construction in the Chemical Industry," by Dr. K. W. J. Bowen.

YORK.—Royal Station Hotel, 7.30 p.m. A.S.E.E., York Branch. "Earth Leakage Protection of Domestic and Industrial Installations," by J. A. Robbins.

Wednesday, 18th September

WEMBLEY.—A.S.E.E., South West London Branch. Visit to Associated Rediffusion Television Studios at 2.30 p.m.

Thursday, 19th September

BLACKBURN.—Golden Lion Hotel, 7.30 p.m. Incorporated Plant Engineers, Blackburn Branch. "Britain's Fuel and Power Problems," by Rear Admiral Sir Sidney Frew.

SITTINGBOURNE.—Shakespeare Hotel, 7.30 p.m. A.S.E.E., Kent Branch. "Electrical Safety," by S. J. Emerson.

Friday, 20th September

CHESTER.—A.S.E.E., Liverpool and District Branch. Visit to Hawarden Bridge Steelworks, Shotton, of John Summers & Sons, Ltd.

CREWE.—Royal Hotel, 7.30 p.m. A.S.E.E., Stoke and Crewe Branch. "Science and Responsibility," by Dr. M. Pittock.

Saturday, 21st September

OXFORD.—Regent's Park College, Pusey Street, 7 p.m. A.S.E.E., Oxford, Reading and Districts Branch. "Electric Railway Signalling."

CATALOGUES AND LISTS

ELECTRIC MOTORS. — Folder (148) entitled "Guide to the Application of Squirrel-Cage and 'Trislot' Induction Motors."—**Laurence, Scott & Electromotors, Ltd.,** Gothic Works, Norwich.

Illustrated brochure on the L.D.C. range of geared motor units, 1-60 h.p.—**Lancashire Dynamo & Crypto, Ltd.,** Trafford Park, Manchester, 17.

FLAME FAILURE ALARM.—Technical literature describing the "Fireye" flame failure safeguard equipment.—**Fireye Controls Co., Ltd.,** 14, Fetter Lane, London, E.C.4.

INDICATOR FITTINGS.—16-page illustrated catalogue of indicator light fittings.—**William McGeoch & Co., Ltd.,** 46, Coventry Road, Birmingham, 10.

INFRA-RED GRILL.—Descriptive folder dealing with the "Grill-Quick" infra-red grill.—**S. I. Engel,** 23-25, Kensington Park Road, London, W.11.

INSTRUMENTS.—Leaflet describing the "Commander" electronic potentiometric instruments.—**George Kent, Ltd.,** Luton, Beds.

LABORATORY APPARATUS. — Leaflet describing a portable electric laboratory sample mill, a disc mill and a sliding and rotating weight balance.—**Glen Creston, Ltd.,** 41, Church Road, Stanmore, Middlesex.

LIGHTING FITTINGS.—Price list and index giving the latest figures for the company's range of lighting products.—**Ekco-Ensign Electric, Ltd.,** 45, Essex Street, Strand, London, W.C.2.

PLUGS AND SOCKETS.—16-page catalogue with separate price list dealing with the company's range of watertight sockets and plugs, switches and couplings, etc.—**William McGeoch & Co., Ltd.,** 46, Coventry Road, Birmingham, 10.

RELAYS.—8-page catalogue giving particulars of the Robinson range of relays.—**D. Robinson & Co.,** 58, Oaks Avenue, Worcester Park, Surrey.

TAPES.—Technical report describing the progress made in the production of irradiated polythene tape together with details of its properties and applications.—**Tube Investments, Ltd.,** The Adelphi, London, W.C.2.

TRANSFORMERS.—Catalogue (424-UK/16) covering the range of "Variac" continuously adjustable auto-transformers.—**Claude Lyons,** 4-10, Ware Road, Hoddesdon, Herts.

TRANSFORMERS. — Three illustrated brochures describing pole and platform transformers, power and distribution transformers and small air-cooled wall or floor mounting and portable types.—**Nelson Engineering Co., Ltd.,** Nelson, Lancs.

N.S.W. 330 kV Transmission Scheme

The N.S.W. Electricity Commission has let contracts for the erection of two major new transmission lines which will cost a total of £3 million and form sections of the future 330 kV "backbone" of the N.S.W. bulk supply system. One of the new lines will extend from Muswellbrook to Tamworth, and the other from Yass to the major hydro-electric stations of the Snowy Mountains scheme. Design, planning and survey work for the new lines have been completed by the Commission, and contracts for their erection let to the Electric Power Transmission Co., Ltd.

The Muswellbrook-Tamworth line will form part of the future link through Singleton between the Commission's main supply system and its Tamworth and New England subsystem. It will be 80 miles long, and though used initially at a lower voltage, will be strung for 330 kV operation using twin conductors.

The 90-mile Yass-Upper Tumut line will interconnect the Snowy Mountains hydro-electric stations with the Commission's system at Yass, and in turn with the major thermal power stations. It will be built through some of the highest and most difficult country in Australia and will be specially strengthened and supported where it rises above the snow line. The route has been surveyed by the Commission, and a 30-mile access road into the mountains has been built by the Snowy Mountains Authority. Twin conductors will be used for most of the distance, but it is expected that heavy single conductors of about 1¾in diameter—the largest ever erected in Australia—will be necessary on those sections subject to severe ice conditions. Crossing the main range near Kiandra at a height of more than 5,000ft, the line will terminate at the Snowy Mountains switching station to be built below Cabramurra. From the switching station, further overhead conductors will continue for a short distance, descend steeply down the mountain side, and cross the Tumut River to a cable termination. From that point heavy single-core 330 kV cables will be used, re-crossing the river on a special cable bridge, and sloping down through a tunnel to an underground transformer hall.

The Commission's contract includes the erection for the Snowy Mountains Authority of the overhead section of line between the cableyard and the switching station, and the supply of towers for the high altitude section of the line which will be built to carry power to Victoria. The pattern of the future 330 kV system in N.S.W. will be clear when it is explained that one section has been completed between Tallawarra and Goulburn; a second section is now being strung between Goulburn and Yass; construction work has begun on another section between Sydney and Lake Macquarie; and both the new contracts are due for completion in 1958.

The future 330 kV system, extending from the Victorian border to Armidale, will be one of the world's major transmission systems.

DOUNREAY TO USE P.&G. STORAGE BATTERIES

Pritchett & Gold are playing their part in this new era of nuclear power. The U.K. Atomic Energy Authority have awarded them a contract to supply the storage batteries for Dounreay—the fast breeder reactor which will provide information for the more advanced stages of Britain's nuclear power programme. P. & G. will equip Dounreay with a 240 volt 800 Ah battery and associated charging and distribution equipment for essential services, including emergency lighting. P. & G. are also supplying a 50 volt battery, with charging and distribution equipment to provide the current for a variety of indicating and recording instruments. Finally, there will be a P. & G. 110 volt 150 Ah battery and equipment for switch-gear operation. All this, of course, in addition to the batteries which P. & G. continue to supply for conventional power stations.

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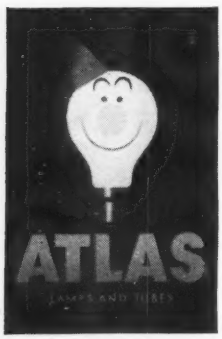

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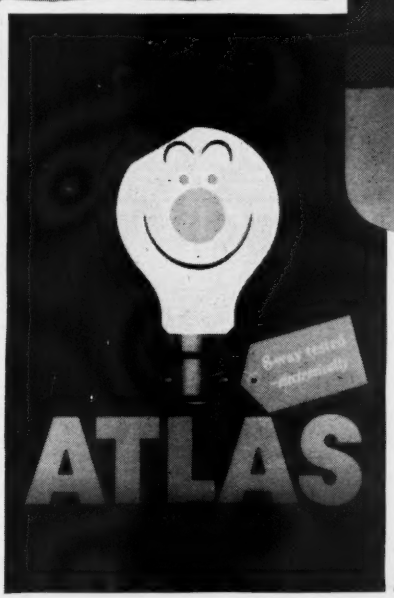

3 **OUTDOOR ADVERTISING** including bus sides, 16 sheet posters, escalator panels, etc.

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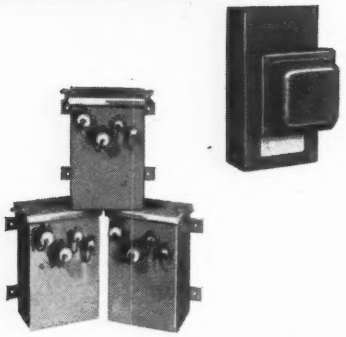

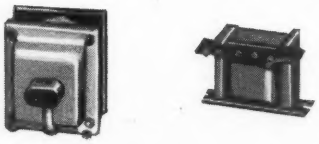

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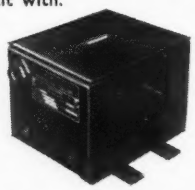

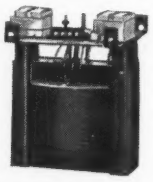

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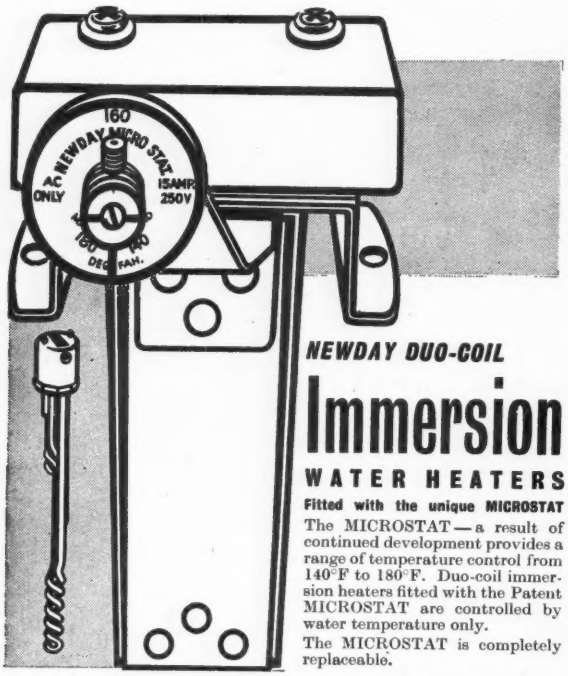

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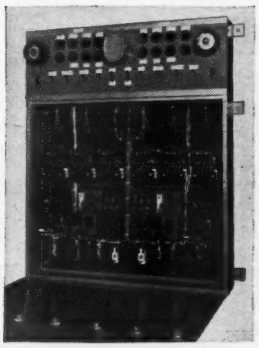

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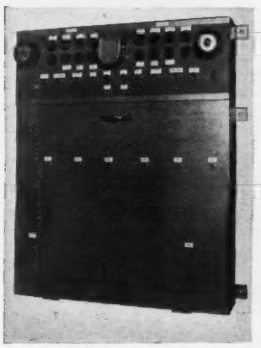

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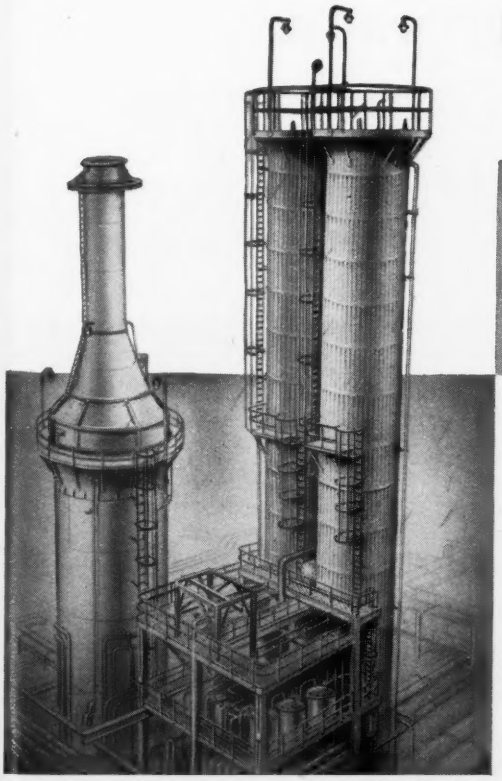

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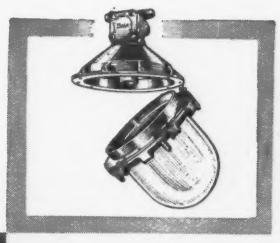

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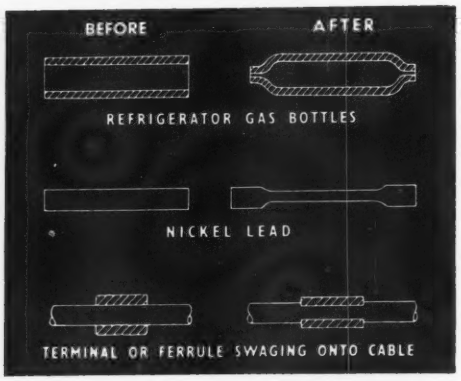

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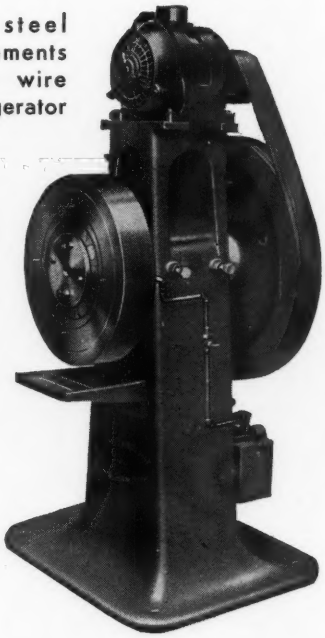

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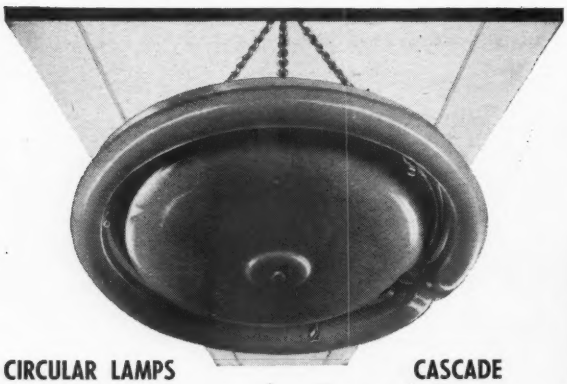

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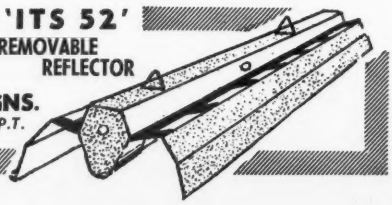

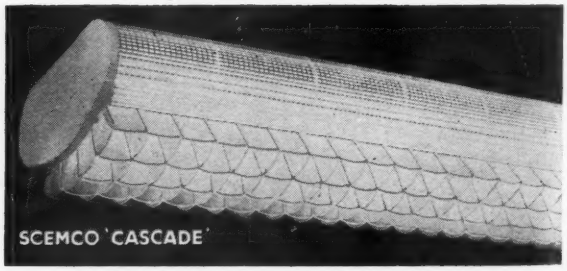

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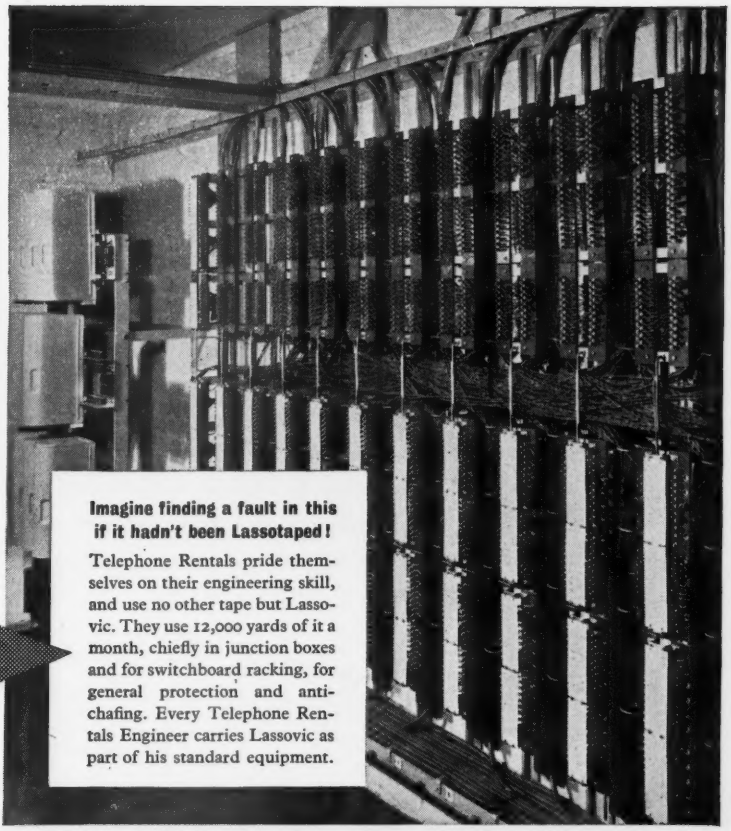

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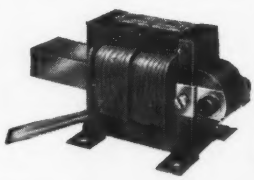

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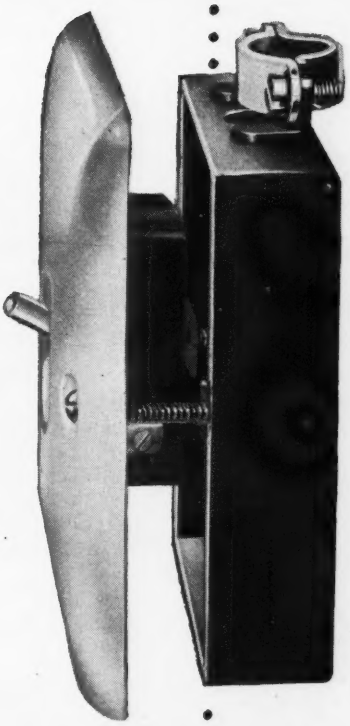

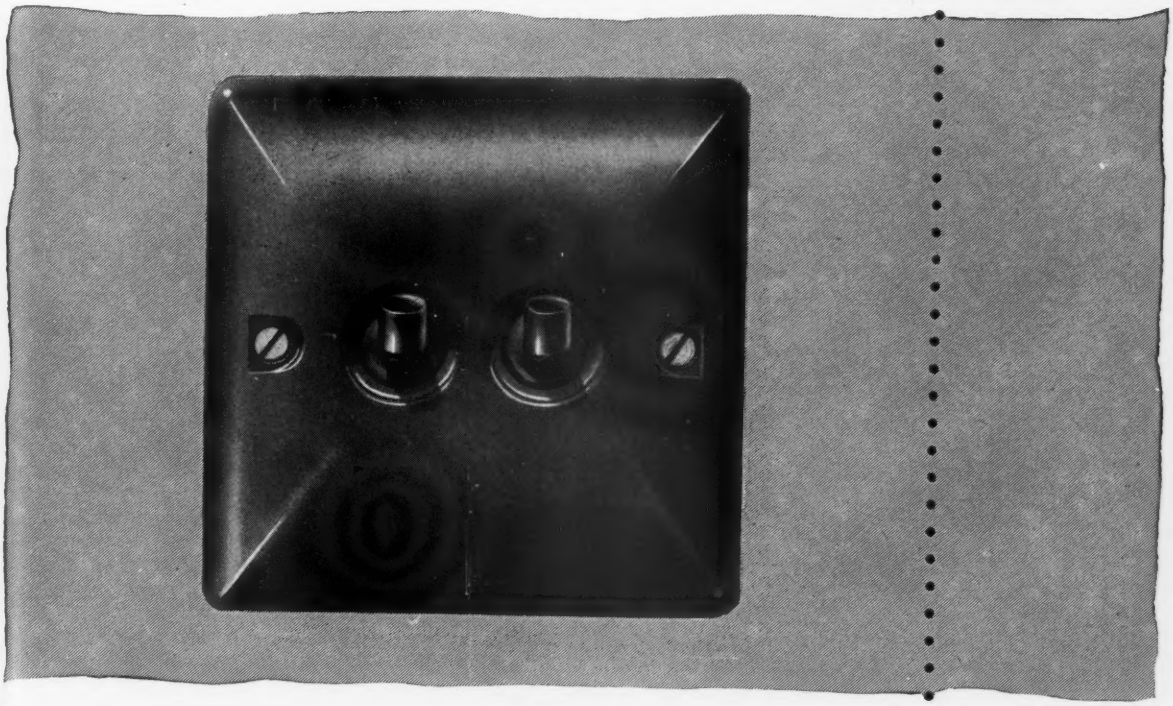

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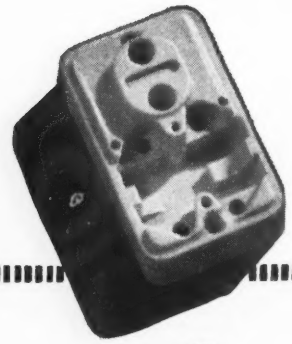
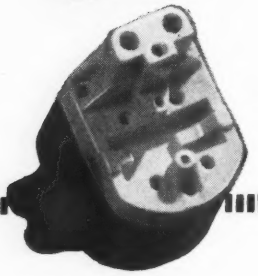


porcelain



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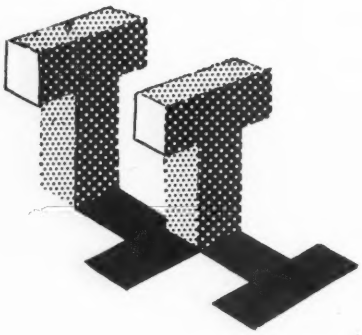
Our long experience as manufacturers of die-pressed porcelains for all electrical accessories is at your service.

The 'T.T.' Trade mark is a safeguard of good quality for all electro-ceramics, whether H.V. or L.V. insulators, refractories for electrical heating elements, H.F. ceramics etc., etc.

We would also remind you that "FISH SPINE" insulating beads are still the highest quality and most accurate beads available.



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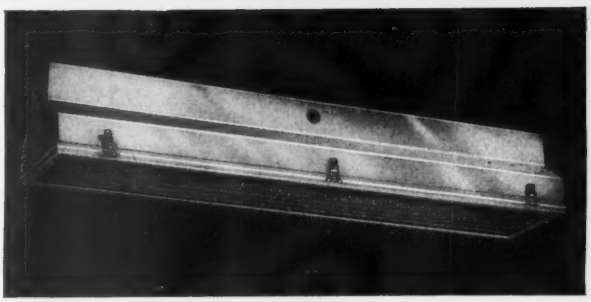

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THE USE OF HARDWOOD BLOCKS

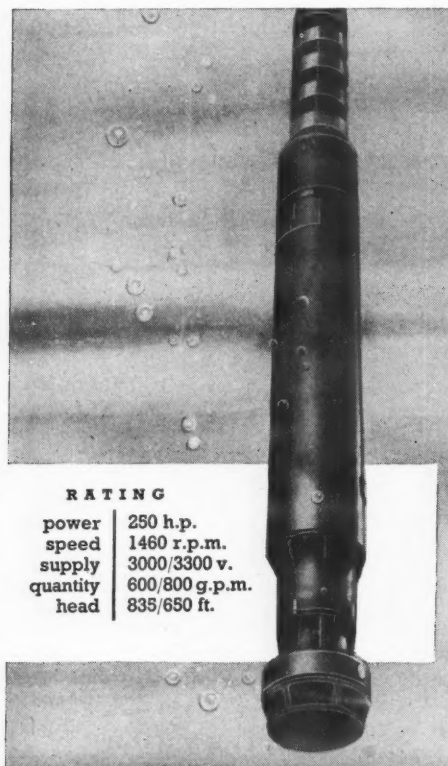
REGULATION 209(B) of the REGULATIONS for the ELECTRICAL EQUIPMENT of BUILDINGS, issued by the Institution of Electrical Engineers, provides that the enclosure of the termination of wiring shall be incombustible. As explained in INTERPRETATION No. 11 (3rd September, 1956) published by the Institution :—

"The use of switchgear, accessories and lighting fittings which themselves provide enclosure and protection for non-sheathed cable cores permits ready compliance with the requirements. Switchgear, accessories and lighting fittings with recessed backs may be mounted on British Standard Boxes. Alternatively they may be mounted on the building structure if it is of brick, stone, hardwood (but not hardboard), plasterboard or lath-and-plaster, provided that the surfaces are continuous and undisturbed and free from paper, and that secure mechanical fixing is obtained. Any cable holes that may be necessary through the supporting material must be accurately and neatly drilled and plugged with fire-resisting compound."

THE USE OF WOOD BLOCKS TO SUPPORT ACCESSORIES HAVING RECESSES FOR WIRING IS THUS RECOGNISED PROVIDED THEY ARE OF BEECH, OAK (ENGLISH), TEAK OR MAHOGANY, AND SUBJECT TO THE PRECAUTIONS INDICATED IN INTERPRETATION NO. 11

The foregoing has been drafted in consultation with the INSTITUTION of ELECTRICAL ENGINEERS and the NATIONAL INSPECTION COUNCIL for ELECTRICAL INSTALLATION CONTRACTING

Issued by THE ASSOCIATION OF BRITISH WOOD BLOCK MANUFACTURERS



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power	250 h.p.
speed	1460 r.p.m.
supply	3000/3300 v.
quantity	600/800 g.p.m.
head	835/650 ft.

still perfect after
17,000 *hours under water*

After 2 years operation a Harland High Tension Submersible Pumpset was lifted for inspection and revealed no trace of wear, corrosion or winding deterioration. The Harland Pumpset was supplied to the South-West division of the National Coal Board for mine dewatering and was the first high-tension submersible to be installed in Great Britain. This instance provides striking proof of the sound design, careful choice of materials and precise manufacturing accuracy of

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submersible pumpsets

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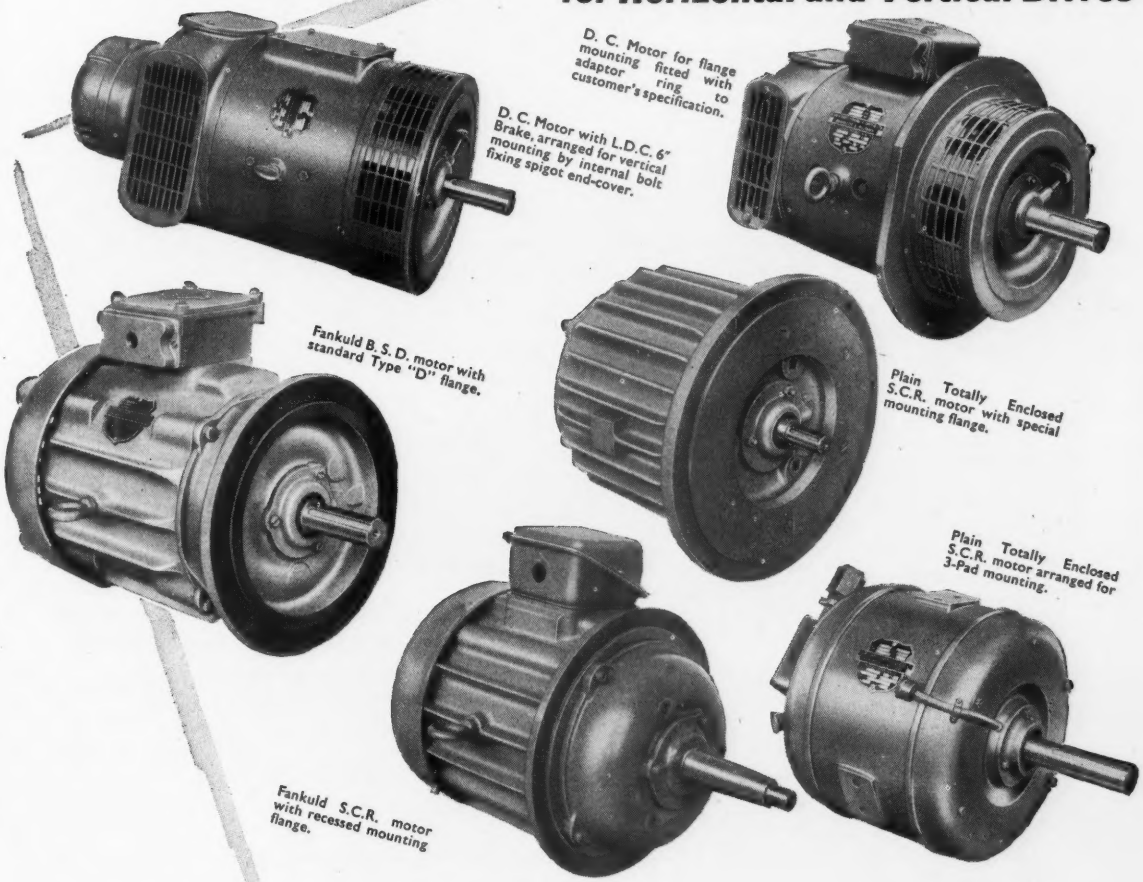
L.D.C.

SPECIAL MOUNTING MOTORS
for Horizontal and Vertical Drives



D. C. Motor for flange mounting fitted with adaptor ring to customer's specification.

D. C. Motor with L.D.C. 6" Brake, arranged for vertical mounting by internal bolt fixing spigot end-cover.

Fankuld B. S. D. motor with standard Type "D" flange.

Plain Totally Enclosed S.C.R. motor with special mounting flange.

Plain Totally Enclosed S.C.R. motor arranged for 3-Pad mounting.

Fankuld S.C.R. motor with recessed mounting flange.

...BUILT TO CUSTOMER'S REQUIREMENTS

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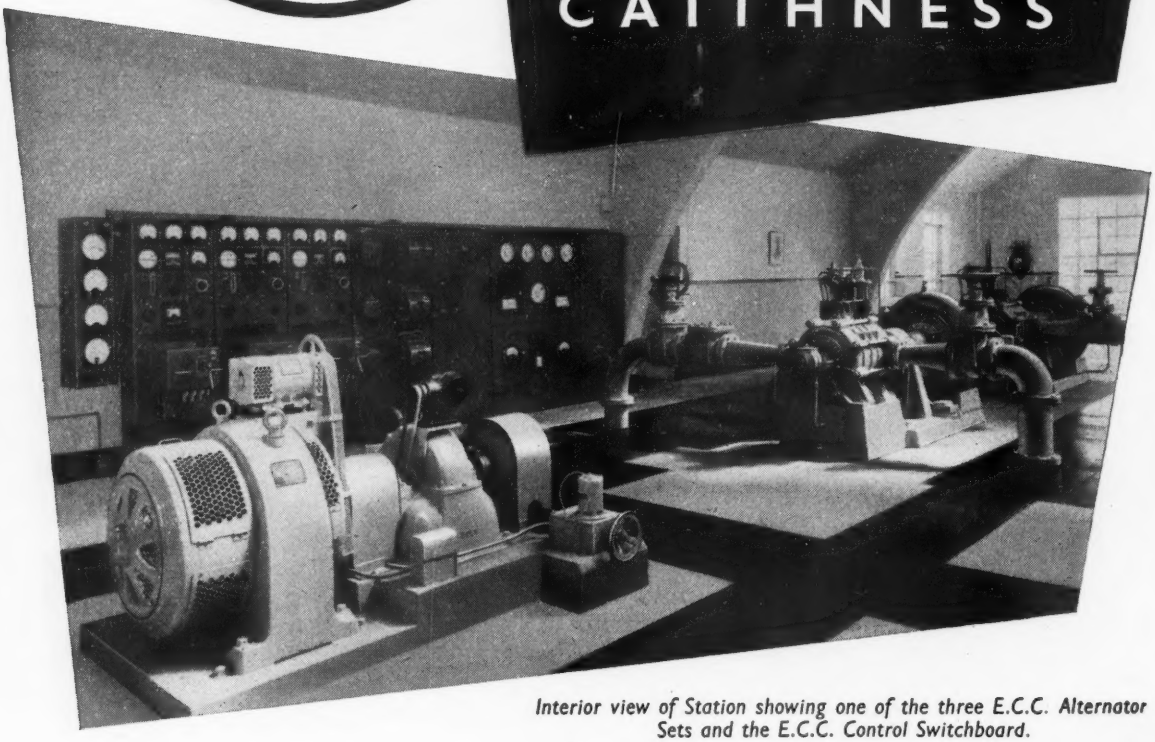

Interior view of Station showing one of the three E.C.C. Alternator Sets and the E.C.C. Control Switchboard.

Based on a catchment area of 6,000 acres draining to Loch Caider, this is one of several schemes in the North of Scotland. It provides water supply to serve almost the whole of Caithness.

The E C C contribution is three 20 kVA 400/230 volts 3 phase 4 wire alternator-exciter sets, with control and distribution switchboard — supplied to the water-turbine builders Gilbert Gilkes and Gordon Ltd.

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Electrolux cylinder type Suction Cleaner model 62 and accessories.

Aluminium Alloy Castings

by William Mills Limited

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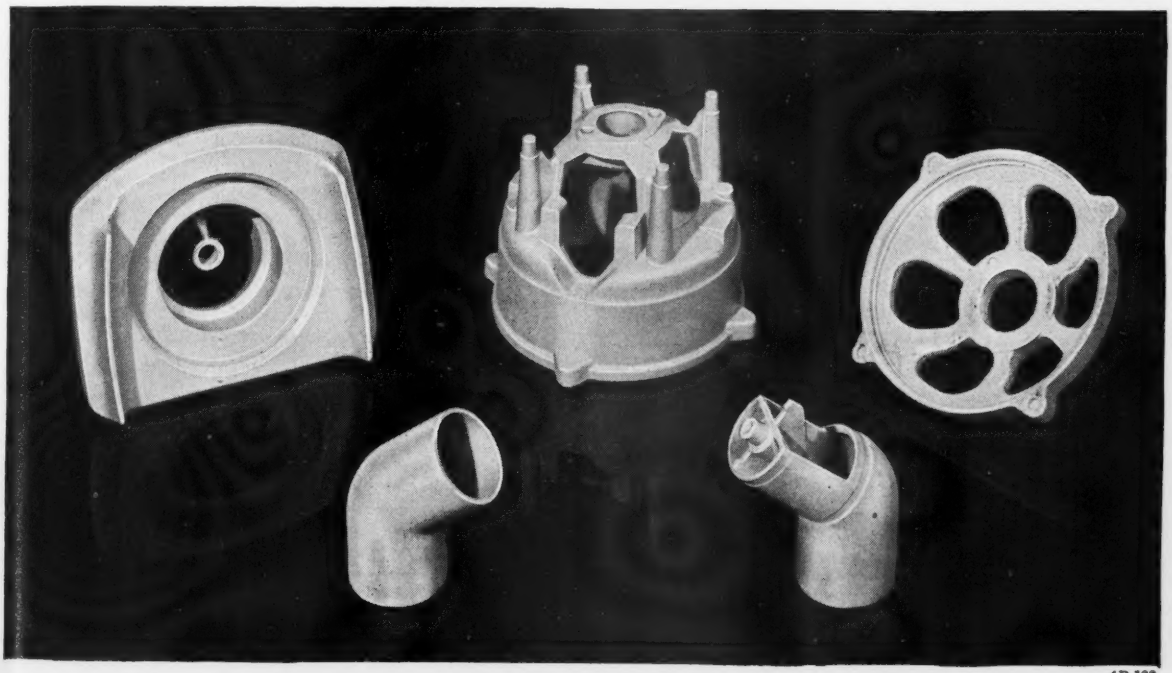

AP-123

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A new range of foil and paper capacitors to meet the exacting requirements of the Fluorescent Lighting Industry, Hunts Therminol Capacitors incorporate the following important features :—

- **Impregnated and filled with a specially developed non-inflammable oil.**
- **Safe and entirely reliable operation in ambient temperatures of up to 70°C.**
- **Housed in oval shaped extruded aluminium cans.**
- **Seam-welded lids which form no exterior ridge, giving increased operating efficiency with reduced dimensions.**

★ *As streamlined as the tube itself.*

SPECIFICATION

Test Voltage:
Capacitors. Up to and including 250 volts A.C. = Wkg volts x 2
above 250 volts A.C. = Wkg volts x 2.5
D.C. Test = A.C. Wkg volts x 3
To Earth, A.C. wkg volts + 1,000 volts A.C. or 2,000 volts A.C. min
Sealing Test: Each Capacitor is heat tested at 80°C
Capacitance Tolerance: Standard limits as shown. Others by arrangement
Power Factor: Better than 0.3% at working volts at 30°C

TYPE L89/1 STANDARD RANGE

Capacitance μF	Volts A.C. wkg.	List No.	Dimensions—inches	
			Length	Cross section of all units
3.2 min	250	ZG101	2	2.148 x 1.398
4 min	250	ZG102	2 1/4	
5 min	250	ZG103	2 3/8	
6 min	250	ZG104	3	
7.4 min	250	ZG105	3 1/2	
3.5±5%	400	ZG106	3 1/4	
6.8±5%	400	ZG107	5 3/8	

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MAKERS OF FIXED CAPACITORS for all RADIO, ELECTRONIC and ELECTRICAL POWER USES, DRY ELECTROLYTIC — METALLISED PAPER — FOIL and PAPER — SILVERED MICA — STACKED MICA — CERAMIC — TRANSMITTING TYPES, etc., etc.

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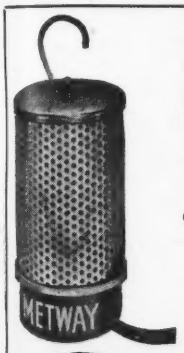
Factories also in Surrey and North Wales



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The little heater with 101 uses:
Car radiators, water tanks and pipes, greenhouses, kennels, chicken houses, etc.
Available in 25 watt, 60 watt, 100 watt
List No. DA/11
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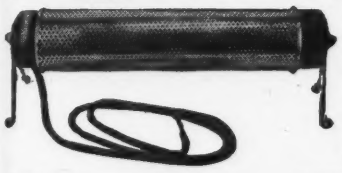

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For Airing Cupboards, etc.

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DA1911	250	19/11	8/7
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FERRULE END TYPE
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9 SIZES—10 to 250 WATT

Fully vitrified porcelain former, winding 80/20 nickel chrome wire. High rating, liberal safety margin and tolerance.

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Axial or radial leads, tinned, securely fixed to unit and capable of supporting the weight of resistor, which can therefore be soldered into equipment.

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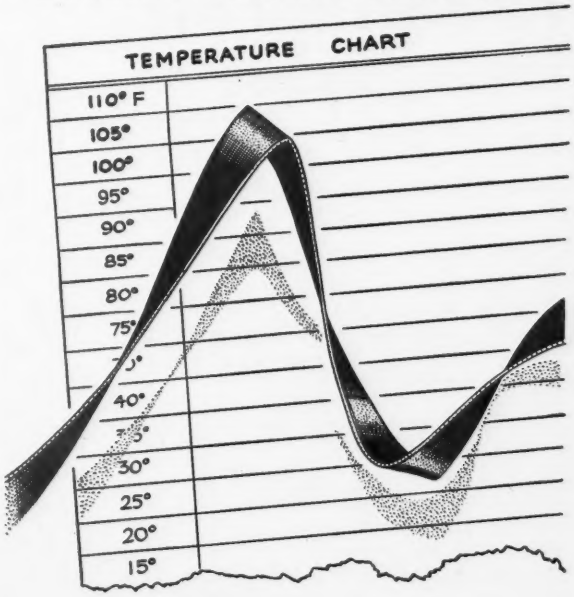

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PB 52

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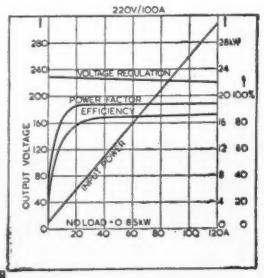

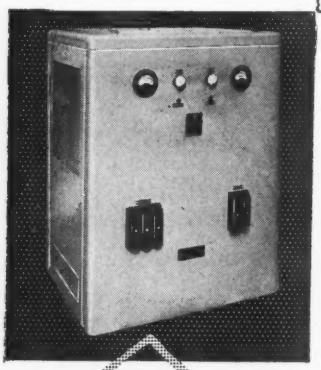

General characteristics of a typical Philips Rectifier can be seen from the graph above, showing a rectifier designed to operate from 3-phase supply and giving up to 100 amps at 220/230 volts DC.
The curves indicate:

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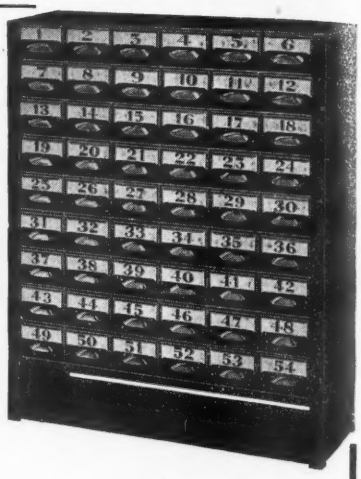
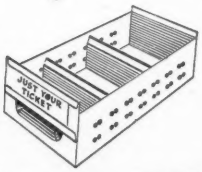
ALL STEEL Stove Enamelled BRONZE GREEN

OVERALL SIZE 42" HIGH 36" WIDE 12" DEEP





Contains 54 of these drawers, each 5" wide, 3" high, 11½" long. 54 dividers and 54 drawer cards with each unit. Extra dividers 4d. each.

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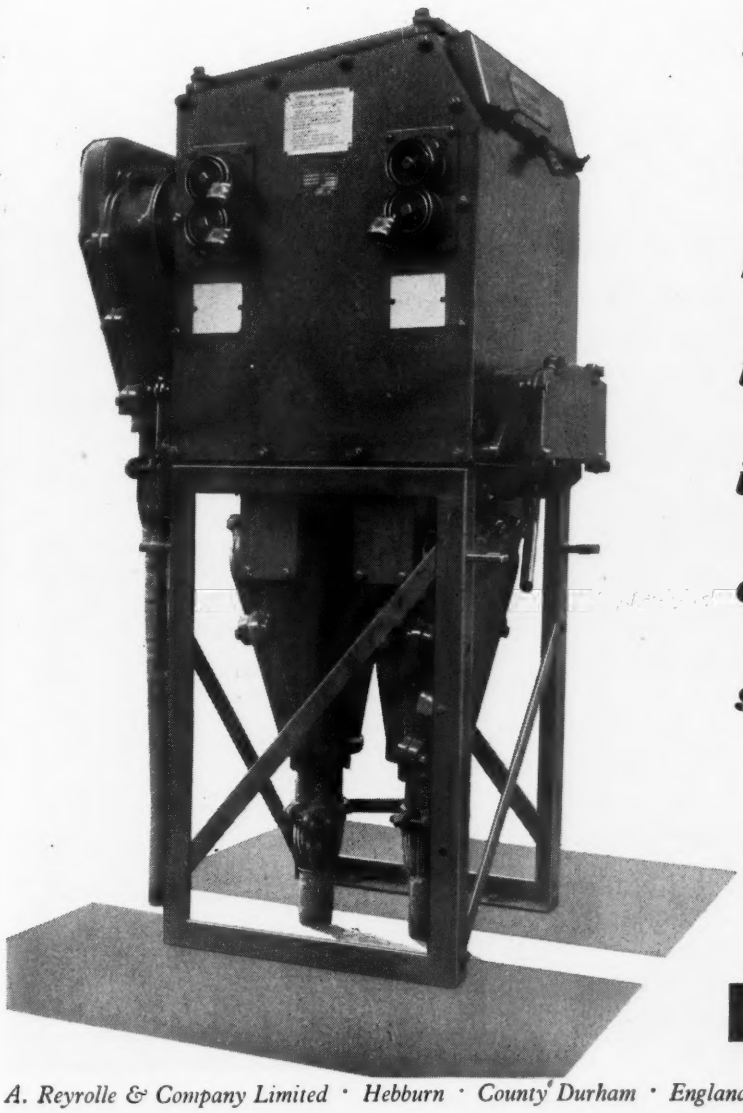
Up to 11 kV

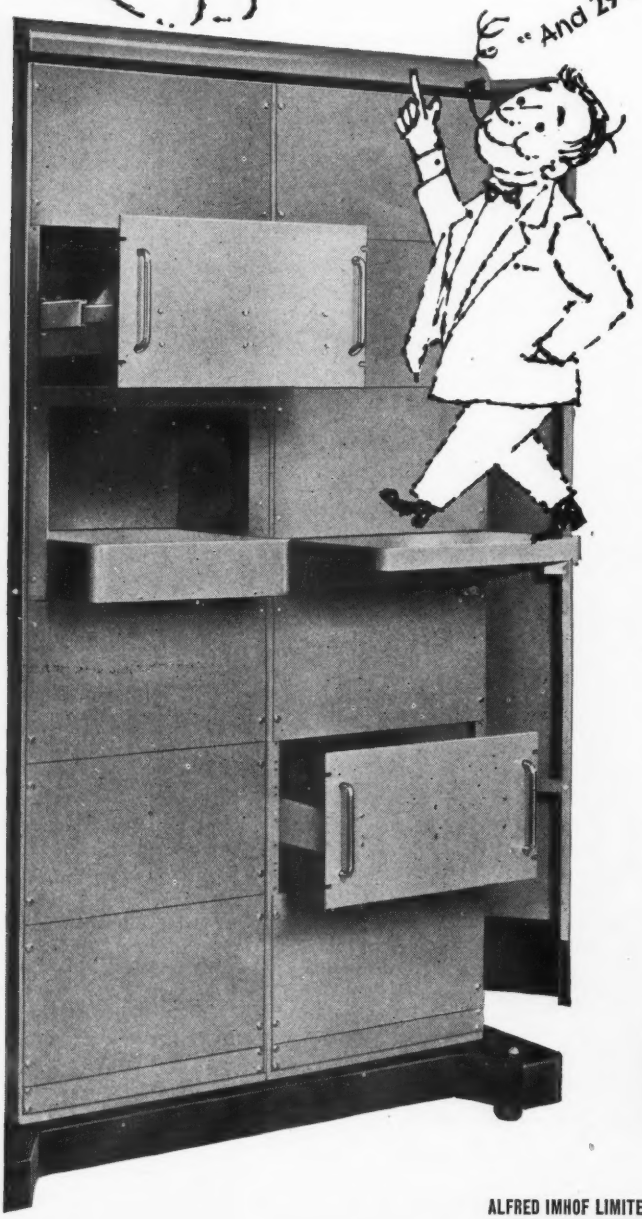


Reyrolle switch and fuse-switch units for indoor and outdoor service

SEND FOR PAMPHLET NO. 1281

Reyrolle

A. Reyrolle & Company Limited · Hebburn · County Durham · England



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MUDIE'S ELECTRICAL CO. LTD. BIRMINGHAM 28

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FRONT ACCESS TYPE
for service up to 5000 amps
at 660 volts

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overhead bus-bar equipment travelling contact type

Illustrated is an installation fitted to a 2-ton crane.

Donovan "Runtact" power duct is ideally suitable for feeding electric power to hoists or small cranes, and enables portable power to be supplied over long lengths with the utmost facility. Outstanding features include:

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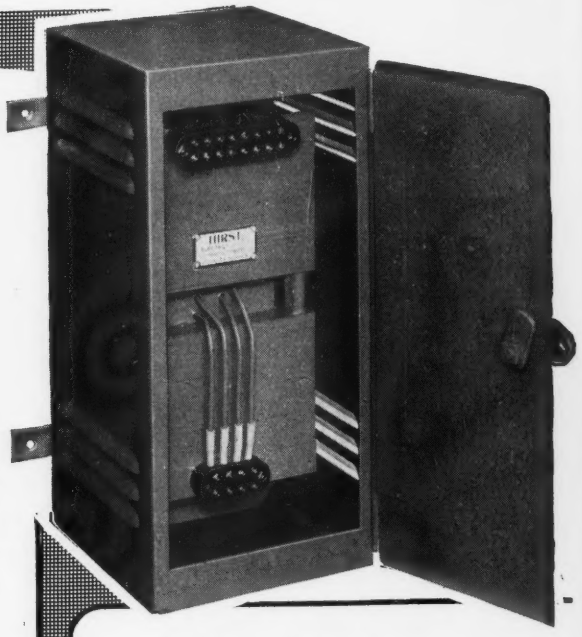

A Saturable Reactor is an infinitely variable A.C. Choke. It has no moving parts, control being effected by forcing a D.C. magnetic field through the A.C. magnetic circuit, the D.C. field being controlled by a small resistance. Ideally suited for building into all A.C. and A.C./D.C. power equipments. Non-standard voltages and frequencies are catered for. Units up to 75 kVA have been supplied by H.E.D.

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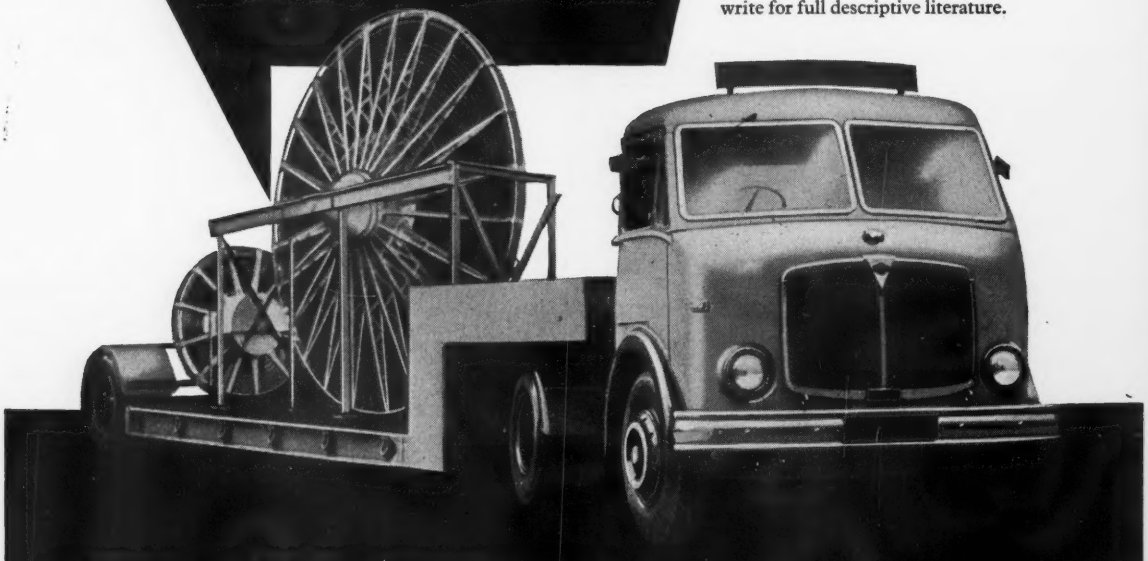

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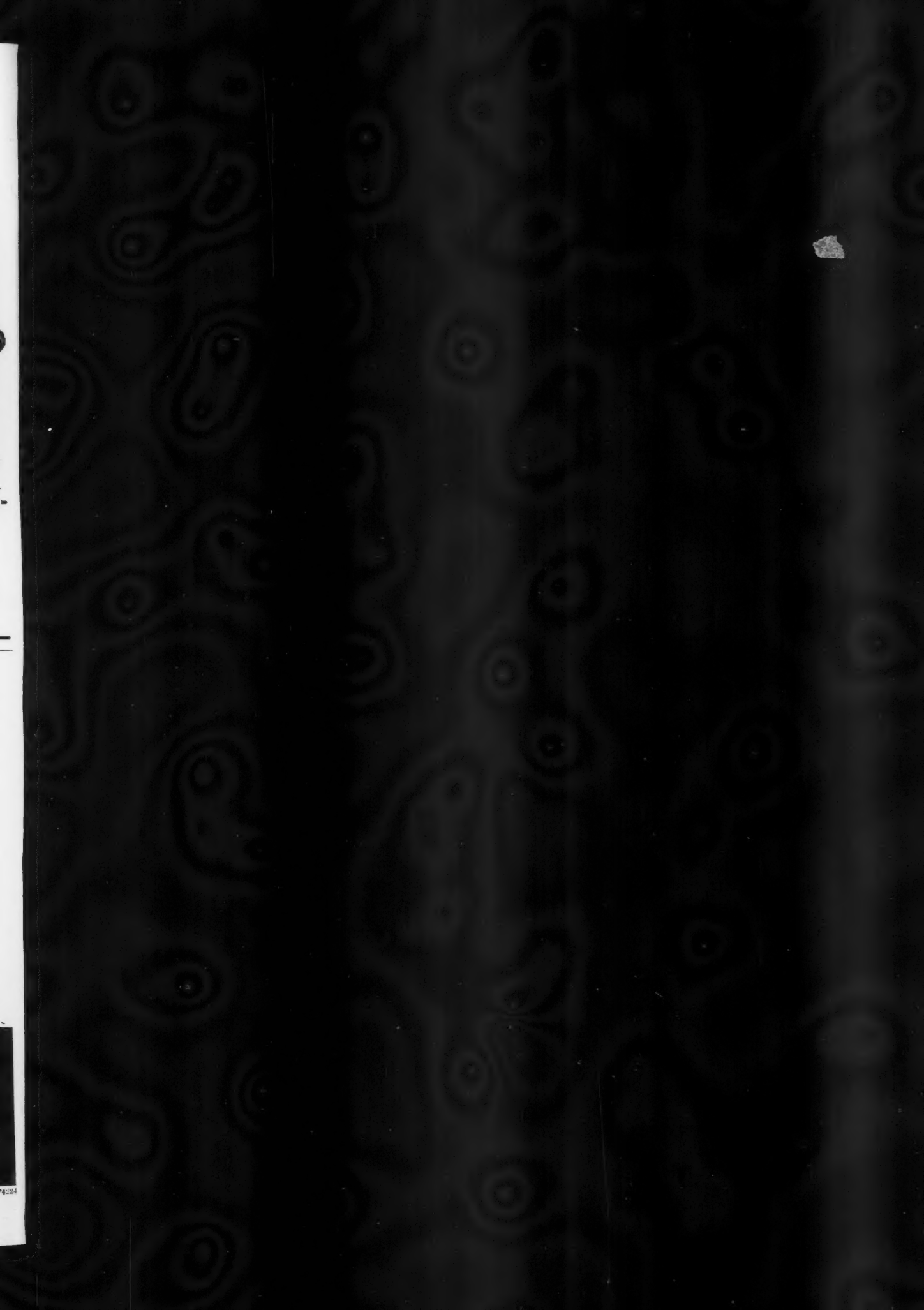

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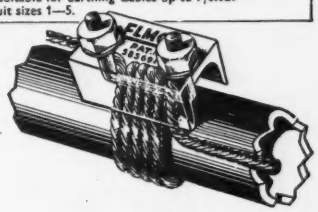

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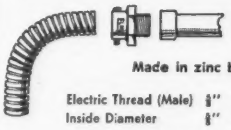

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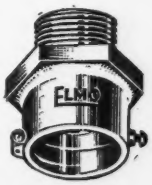

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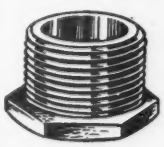

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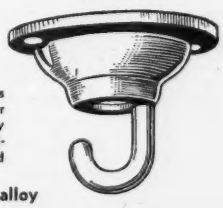

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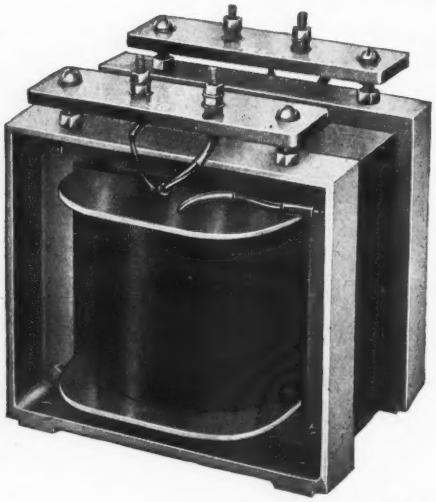

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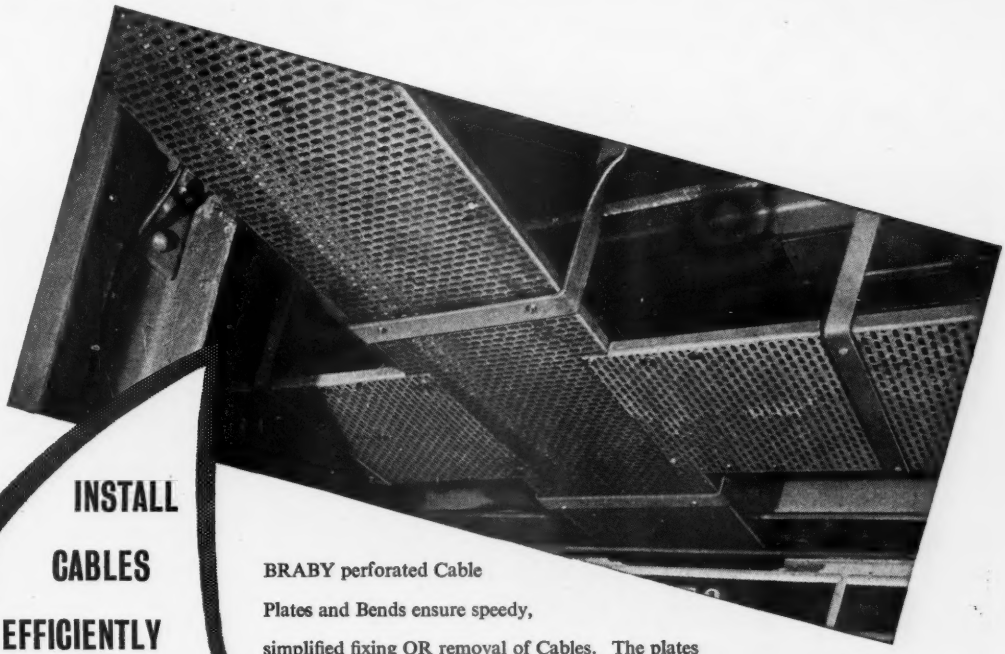

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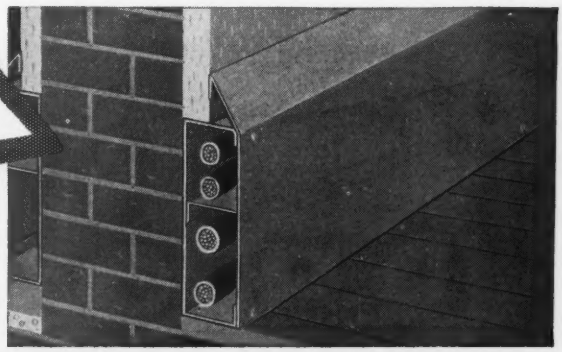

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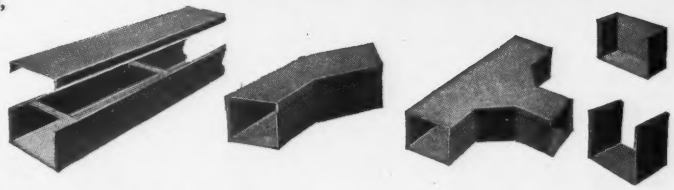

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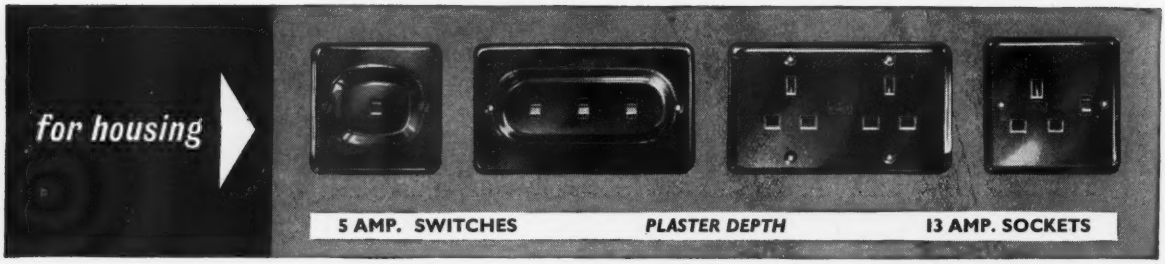

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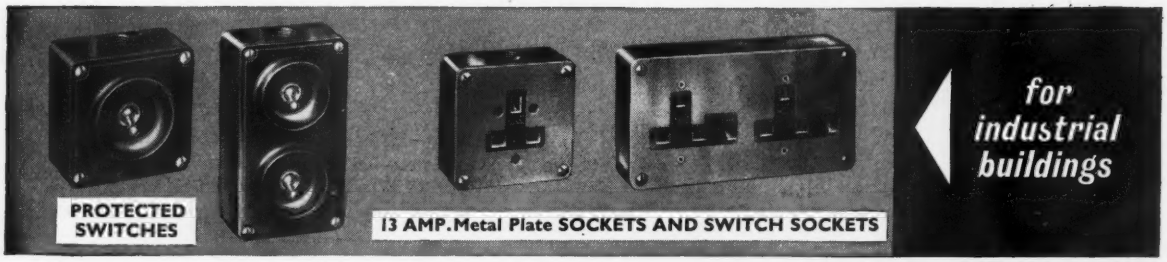

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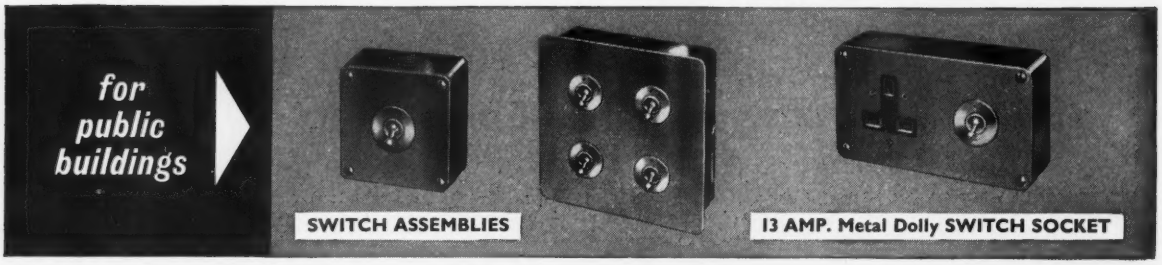

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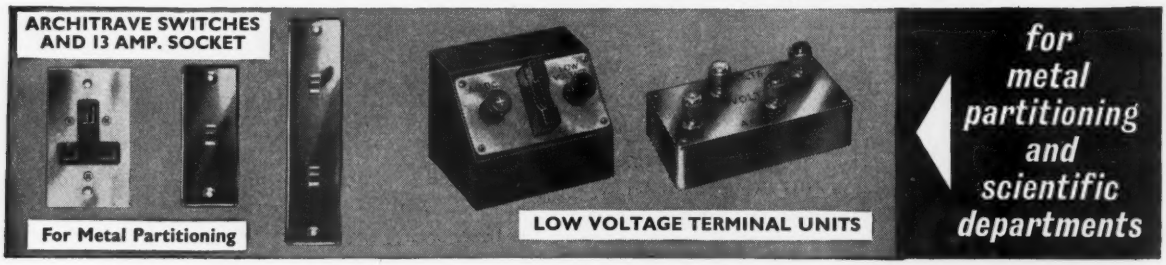
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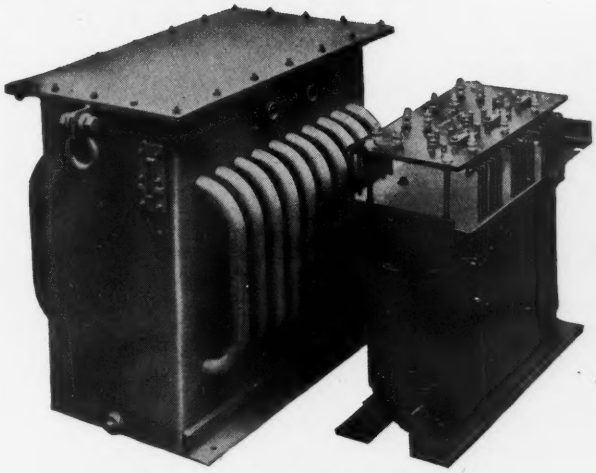

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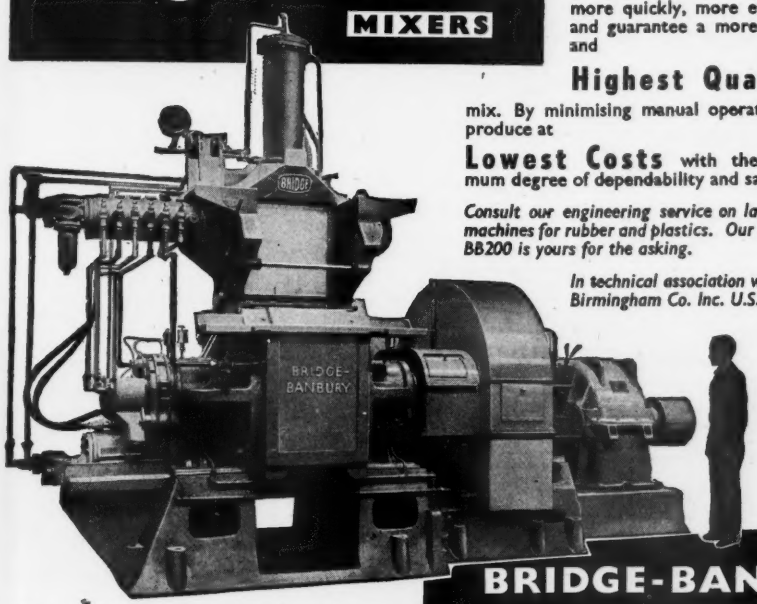

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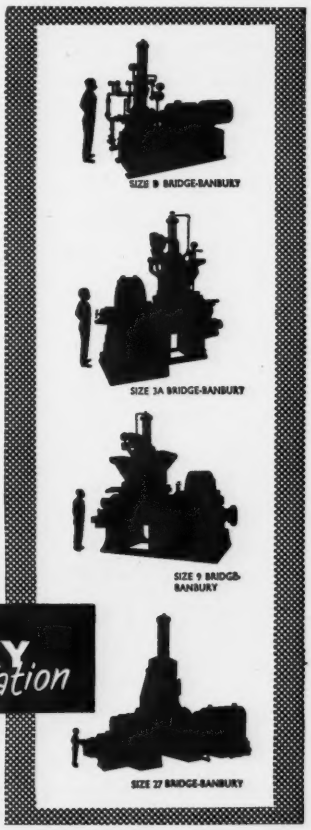

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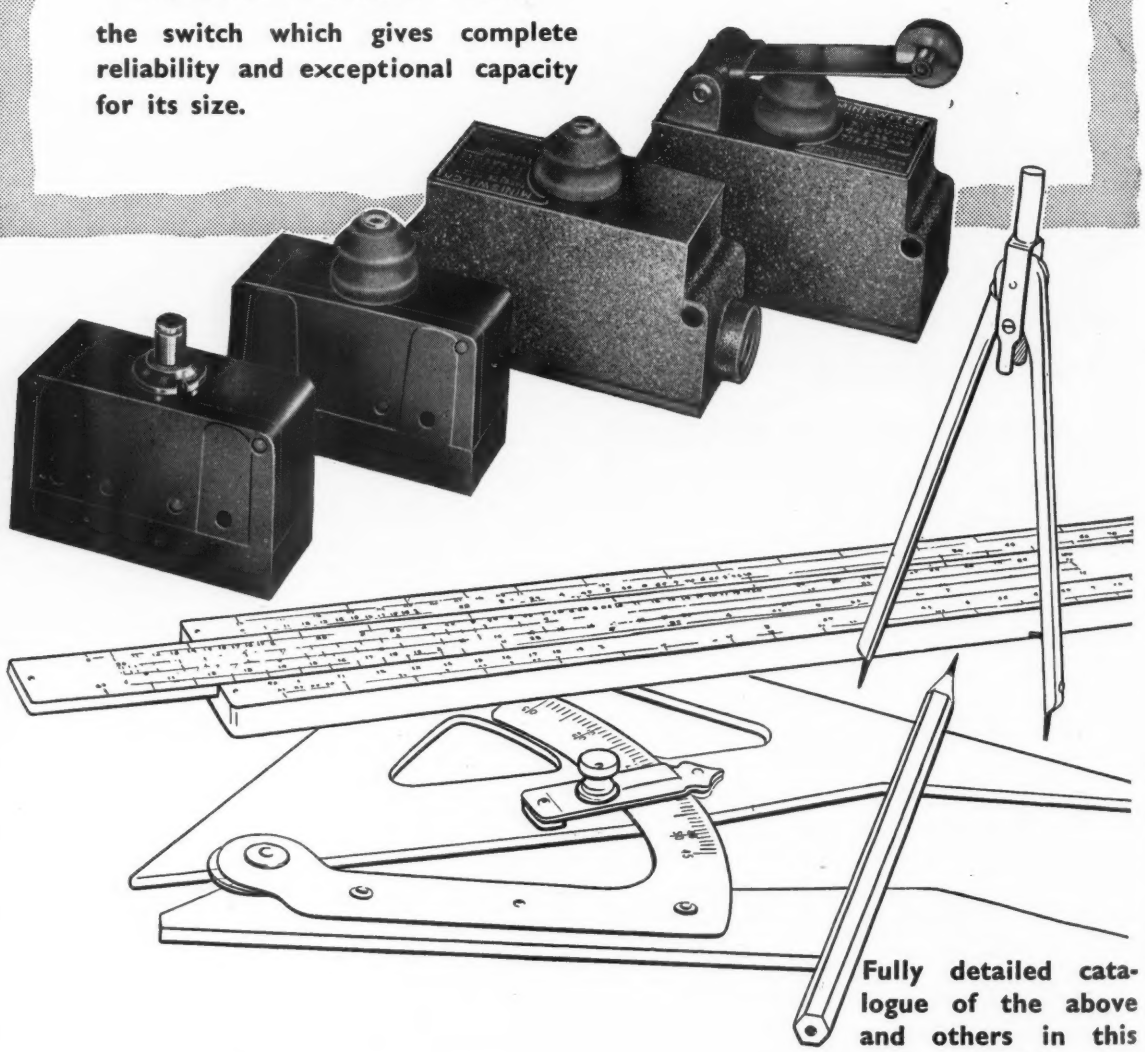

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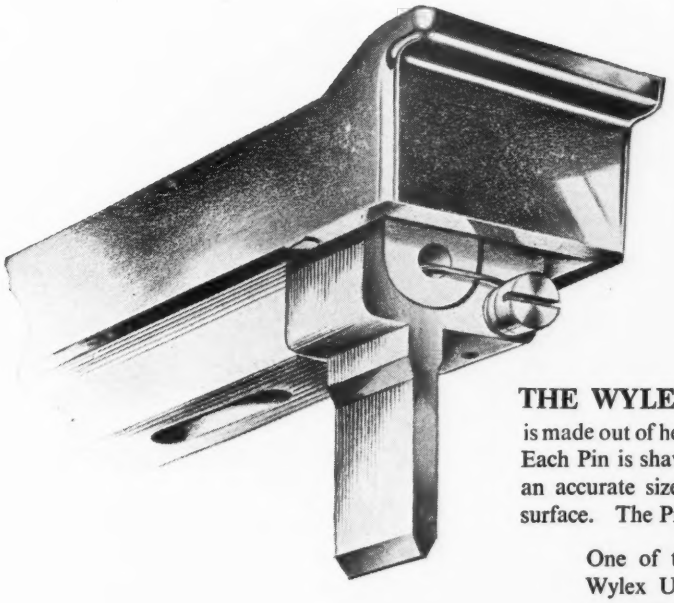

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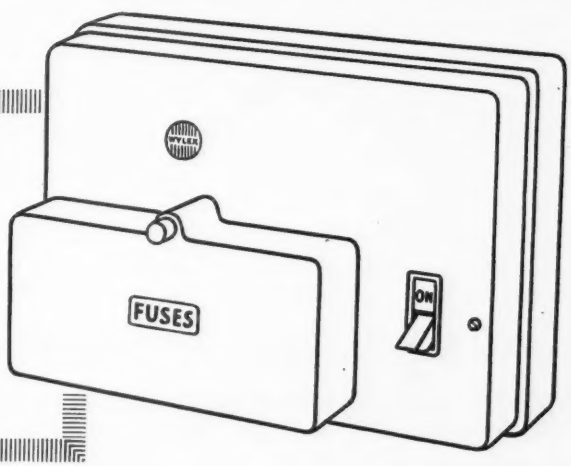

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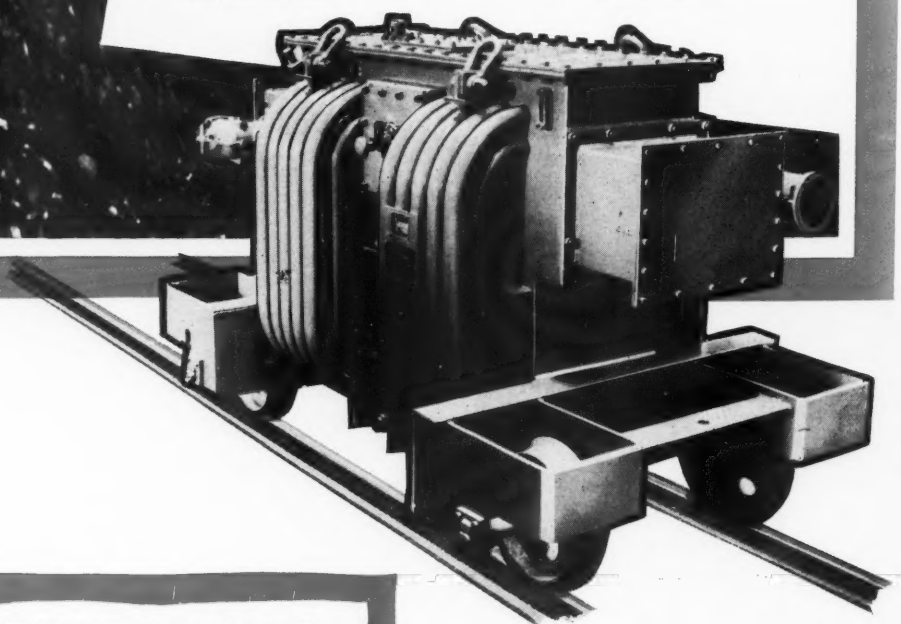

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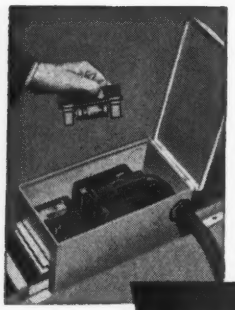

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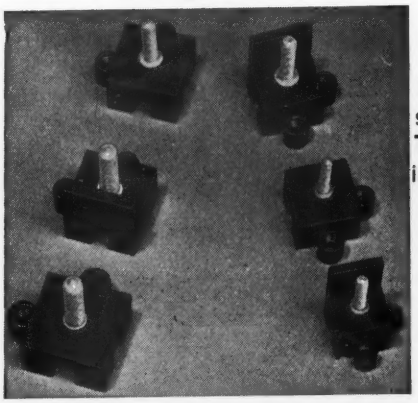

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Extel House.....the new head-quarters of the Exchange Telegraph Company is fitted exclusively with *Standard* Rubber and Plastic cables for lighting & power systems

Behind the facades of many imposing buildings which are changing the face of parts of London, cables for lighting and power must match in quality and durability the fine new buildings themselves. That is why leading contractors safeguard their reputation by installing *Standard* rubber, plastic and textile insulated cables throughout.

Electrical Contractors:
Troughton & Young Ltd.
Knightsbridge, S.W.3.

Extel House

Standard Telephones and Cables Limited

Registered Office Connaught House Aldwych London W.C.2

48, NORTH ROW, PARK LANE, LONDON, W.1

REPRESENTATIVES AND WAREHOUSES: Birmingham Bristol Dublin Glasgow London Leeds Liverpool Manchester Newcastle Newport Sheffield Southampton Belfast (A. W. Gingell Ltd. Agents)

CROYDON

Precision Power Motors

CROYDON totally enclosed externally cooled Motors are now available for the following ratings :—

3-phase : 2,800 r.p.m. . . . . 2½ h.p.
1,400 „ . . . . . 2 h.p.

1-phase (Capacitor Start) :
2,800 r.p.m. . . . . 1½ h.p.
1,400 „ . . . . . 1½ h.p.

Range of Motors up to 2½ h.p.

Backed by 33 years Experience

If you have a Motor Problem Consult

Also
F.H.P. Motors for—

Air Conditioning Equipment, Business Machines, Chemical Plant, Control Devices, Electronic Equipment, High Frequency Blowers and Fans, Radar Aerial Drives, Servo Controls and many other applications.
CROYDON manufacture complete Alternator Sets (including H/F Inductor Alternators), Brake Motors, D.C. Centrifugal Blowers, Generator Sets, Geared Units, Polarised Synchronous Units, Hysteresis Motors, Governed Machines, Rotary Converters, Torque Motors—in fact one of the most comprehensive ranges of 'SPECIAL' F.H.P. Motors in the United Kingdom.

CROYDON

THE CROYDON ENGINEERING COMPANY LIMITED
COMMERCE WAY, PURLEY WAY, CROYDON, SURREY

Telephone : CROYDON 4125-6-7-8

If it's Fire Fighting Equipment

GLENFIELD
Fire Hydrants

(TO B.S.S. 750/1950)

offer . . . Superior Materials
High-class Workmanship
100% Proven Service

SCREW DOWN TYPE

Of Meehanite cast iron with gunmetal trim and *solid forged* bronze spindle having cast iron cap and carrying either a loose or captive valve. The inlet can be 3 or 3½ in. dia.

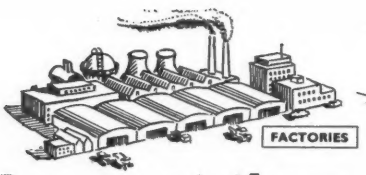
SLUICE VALVE TYPE

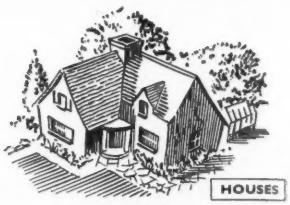
With standard 3 in. dia. Sluice Valve, cast iron socket piece and outlet bend.

All flanges are faced and drilled to B.S.T. "C" and the outlets are screwed 2½ in. dia. B.S. round thread.

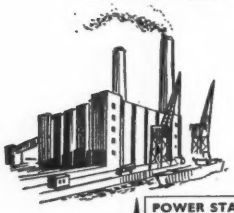
Head Office & Works : KILMARNOCK, SCOTLAND

Glenfield
GLENFIELD & KENNEDY, LIMITED, KILMARNOCK



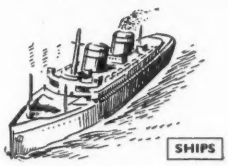


You meet them everywhere...

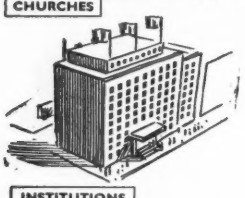


. . . on machinery and instruments the world over — engraved plates by Thew of Gateshead instructing, warning, or directing in many languages. You will find them too, on ships of every nation, on planes, and on trains.

We make them in any quantity, in ivorine, plastic, brass, enamelled bronze, aluminium, and other metals. If you require engraved nameplates of any size, in any quantity, ask us to submit samples and suggestions.



for ENGRAVED NAMEPLATES—



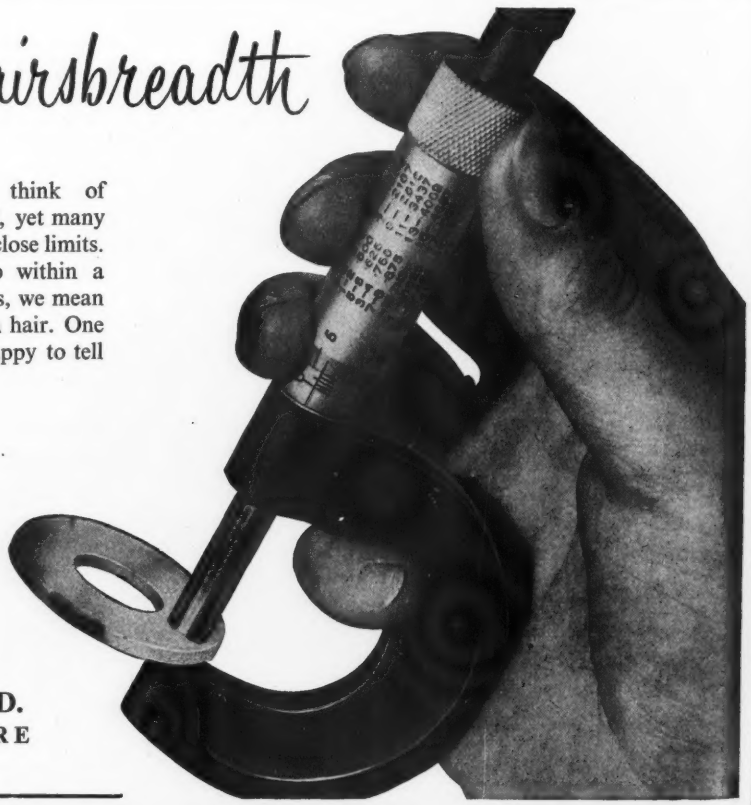
THEW OF GATESHEAD ON TYNE

SPECIALISTS IN NAMEPLATES FOR THE ENGINEERING AND ELECTRICAL TRADES

EDWARD H. THEW LTD., 1 FIRST AVENUE, TEAM VALLEY TRADING ESTATE, GATESHEAD-ON-TYNE 11

Literally—a hairsbreadth

Today, most progressive engineers think of Coopers Felt as an engineering material, yet many do not know that it can be machined to close limits. With the harder felts we can work to within a hairsbreadth of your specification. Yes, we mean that literally—to the breadth of a human hair. One of Cooper's technical advisers will be happy to tell you more about this versatile material.



COOPERS FELT

COOPER & CO. (B'HAM) LTD.
BRYNMAWR, BRECONSHIRE
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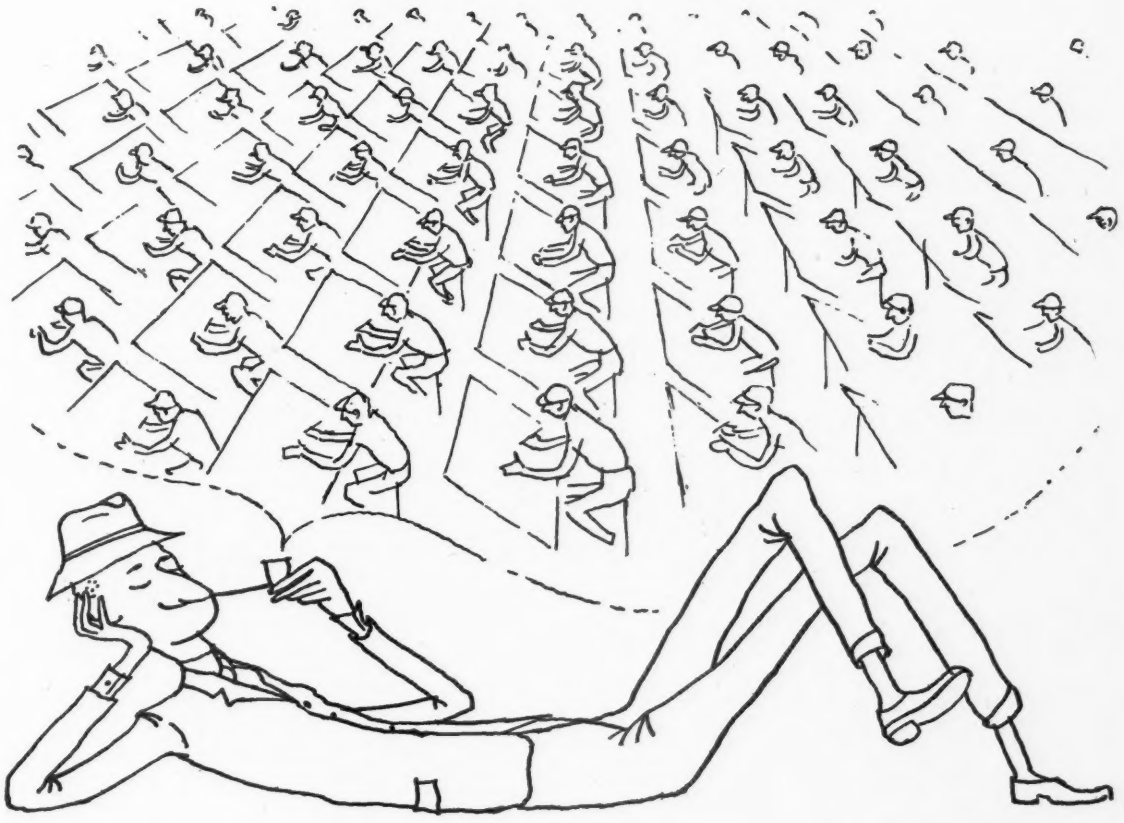
Pipe Dream ?



When you're dreaming up plans to increase production it's time to wake up to AZOFLEX. It's the *only* process to apply a controlled quantity of developer, thus ensuring optimum quality at all running speeds—and it's the only daylight reflex copying process. There are no dangerous chemicals and because no ducting is necessary to take away offensive fumes, machines are freely movable from place to place. Exposing, developing and print delivery are completely synchronised and output is virtually as fast as the operator. In plain language the AZOFLEX MODEL 42/63 can produce more than one hundred 20″×30″ prints an hour at a lower cost per print than you ever dreamed.

AZOFLEX MODEL 42/63 MARK II

Synchronised printing and developing machine. Capacity: cut sheets and rolls up to 42 in. wide. Printing speed: from 6 in. to 15½ ft. per minute. Dimensions: Height 50 in., width 71 in., depth 52 in. with delivery tray extended. Weight: approximately 850 lb.

ILFORD *Azoflex*

Enquiries to:
Ilford Limited, Azoflex Dept. AZ13F
104 High Holborn, London, W.C.1
Telephone: HOLborn 3401

MACHINES AND MATERIALS FOR DRAWING OFFICE PHOTOPRINTING

We'll take it to pieces and put it together with Spire Speed Nuts

If you produce anything that involves fixing one part to another we should like to make you an offer. Here it is: send us a sample of the article you make. Our Product Survey Department will take it to pieces and reassemble it using Spire Speed Nuts, Screws and Clips. Your product will then be returned with an illustrated Fastening Analysis, showing what you would save in time and money by assembling with Spire Fasteners. THIS TECHNICAL SERVICE IS FREE OF CHARGE. If you're interested (and you should be!), drop us a line and we'll send you full details—or call in our Technical Representative, he's a fastening specialist.

Anything you fix **Spire** ***can fix faster***

Enquiries to: **SIMMONDS AEROCESSORIES LIMITED,**
Spire Speed Nut Division,
11a, Albemarle Street, London, W.1.
Tel: HYDe Park 5741/2
Head Office & Works: TREFOREST, PONTYPRIDD, GLAMORGAN.
Branches: Birmingham, Manchester, Glasgow, Stockholm, Copenhagen, Ballarat, Sydney, Johannesburg, Amsterdam, Milan and New York.
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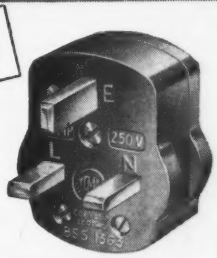

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These numbers

mean so much more

Ease in wiring, greater safety and higher electrical efficiency are not just glib phrases when applied to TEMCO WIRING ACCESSORIES. They definitely mean something, such as terminals conveniently positioned; more room for cables; a snap acting switch action that makes it impossible to draw a continuous arc by misuse; captive cover screws; neat, attractive, non-track mouldings. These are typical of the advantages that give TEMCO unquestioned superiority.

TEMCO

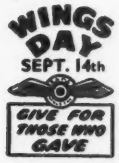
WIRING ACCESSORIES

T.M.C. – HARWELL (SALES) LTD

A subsidiary of Telephone Manufacturing Co. Ltd.

37 UPPER BERKELEY STREET, LONDON, W.1

Tel: PADdington 1867/8/9



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These accessories are also available in cream. Please write for catalogue.

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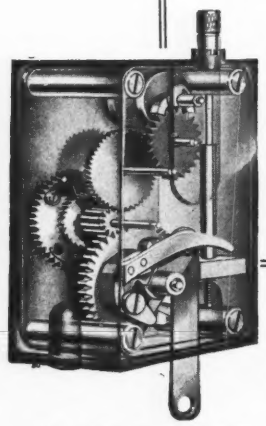


MEETS THE NEED FOR A BETTER TIME LAG

Full information on Rotherham products, including the following are yours for the asking: Time Lags, Instruments, Recording Clocks, Process Timers, Pressure Gauge Movements, Small parts for Engineering, such as Taps, Oil and Grease Cups, Oil Indicators, Unions, Nipples and Olives.

This is the "VAR", a Rotherham Time Lag very much in favour with Engineers who demand the highest standards of accuracy in delayed-action Timing mechanism. It is one of a series of Rotherham instruments, which, for precision performance and absolute dependability has won world-wide preference.

Rotherhams OF COVENTRY

ROTHERHAM & SONS LTD. *PRECISION MANUFACTURERS SINCE 1750*
Telephone **COVENTRY** *64154*

TRADE TUNION MARK

Porcelain Lamp Holders

There are 16 different types available. Details of these and numerous other Tunion Electrical Accessories are included in our CATALOGUE No. 1453 ER (34 pages with 274 illustrations). Why not send for a copy?

**Can be supplied to take B.C. Lamps.*

TM 98 B.C. Batten 1½" fixing centres.

TM 114* E.S. Weather-proof type with loose skirt.

TM 341 B.C. Batten large base 2" centres.

TM 134* E.S. Screwed type. Sizes ¼" gas, ⅜" Conduit.

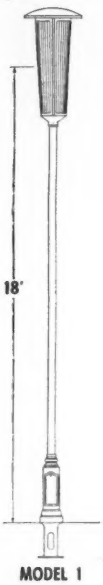
GEORGE TURNOCK LTD.

TUNION WORKS NAVIGATION STREET

WALSALL STAFFS

Telephone: Walsall 4966

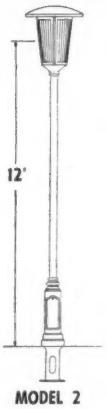
BLEECO VERTICAL FLUORESCENT FITTINGS for STREET LIGHTING



MODEL 1

MODEL 1 with 18 ft. mounting, recommended for CLASS A Roads, will take any number of 4 ft. 40 W lamps up to six.

MODEL 2 with 12 ft. mounting, recommended for CLASS B Roads, will take two or four 2 ft. 40 W lamps.



MODEL 2

- ALL FITTINGS COMPLETE WITH GEAR.
- Fittings can also be supplied with columns.
- The units are also suitable for two and three 45 W or 60 W sodium lamps with gear.
- Two "Perspex" panels are hinged for easy cleaning and lamp renewals.

For further details apply to:

BLEECO LTD.
35 Wellington Road
Brighton 7. *Phone: BRIGHTON 24661*

TRADE MARK ESTD. 1895

60 YEARS OF CABLEMAKING

Specialist Manufacturers of

FLEXIBLE CABLES & CORDS

to B.S.S., G.D.E.S., etc., specifications

Lighting, Power, Dynamo, Lifts, Welding and Trailing, V.I.R. and T.R.S., Asbestos and Flame-Resisting, Enamel, Silk, Cotton and Glass Insulated Wires, Bare Copper Braids, Non-Rubber Flexibles, Plaited Copper Braids and Cords, P.V.C.-Polythene, P.V.C.-Microphone, Screened, Armoured, etc.

SAXONIA ELECTRICAL WIRE COMPANY LTD.

Contractors to the Admiralty, War Office and Air Ministry, etc.
Offices and Works: **ROAN WORKS, GREENWICH, S.E.10**
Grams: "SAXONIST, LONDON." Phones: GREenwich 0463 & 1672
"GREENWICH" CABLES AND FLEXIBLES

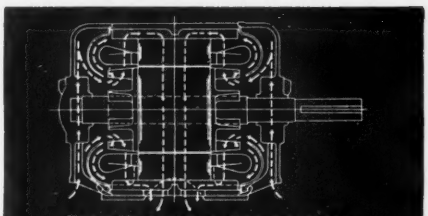
PLASTIC MOULDINGS

Phenolic and Urea

Send your Enquiries to:—

T. BLACKWELL & SON LTD.
Brooker Road, Waltham Abbey, Essex
Telephone: Waltham Cross 2430

These new, smaller motors *pack more power!*



Typical Airflow Arrangement.
A.C. Squirrel Cage Ventilated
Motor Series 5

What the series 5 range covers

POWERS: 1 h.p. to 50 h.p.

SPEEDS: 2, 4, 6 and 8 poles.

MOUNTINGS: Horizontal foot; Horizontal flange; Vertical flange; Vertical skirt base.

Crompton Parkinson Series 5 motors are three phase, A.C. motors—conforming to a new draft BS for dimensional details and to BS 2613: 1957 electrically for Class E insulation.

By designing a new range in the light of modern materials, modern theoretical knowledge and modern manufacturing techniques, Crompton Parkinson have been able to pack more power into a given space than has hitherto been possible.

Note these points:

• THEY ARE AVAILABLE FROM STOCK UP TO 7½ h.p. 1400 r.p.m. AND 5 h.p. 940 r.p.m.

• THEY COST LESS.
• Cool air is drawn over the bearings at *both* ends.
• The stator case is isolated from the carcase by a stream of cool air.
• The shields, which direct the air over the bearings, also provide complete protection for the end-windings.
• The large central outlets in the sides and between the motor feet allow the cooling air to leave at low velocity and diffuse gently into the atmosphere.
• They conform to British Standards—performance and dimensions.

ELECTRICAL EQUIPMENT

Crompton Parkinson LIMITED

CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2. TELEPHONE: CHANCERY 3333. TELEGRAMS: CROMPARK ESTRAND LONDON

Repair Service OF ELECTRIC BLANKETS

Denhams' factories have unmatched experience in repair and overhaul for the trade of ELECTRIC BLANKETS and PADS of all makes, British & Foreign.

LARGEST AND LONGEST ESTABLISHED
RAPID 5 DAYS' SERVICE

Nationally known for thoroughly reliable and inexpensive repairs. Free estimates on request.

Service Department:
DENHAMS (NCH) LIMITED
ST. GEORGE'S WORKS, ALL SAINTS RD., LONDON, W.3

NORVIC LOW-VOLTAGE ELECTRIC BLANKETS WERE SELECTED FOR USE BY THE TRANS-ANTARCTIC EXPEDITION.

MAKERS OF Norvic AND CORONA ELECTRIC BLANKETS

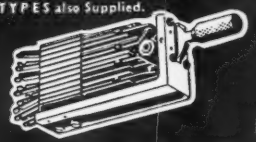
RELAYS

P.O. TYPES MANUFACTURED TO YOUR SPECIFICATION

PROMPT DELIVERY

3000 TYPES

COILS up to 80,000Ω.
CONTACTS up to 8 c/o's
Tropicalizing and impregnating to order.
600 and HIGH-SPEED TYPES also Supplied.



LARGE STOCKS OF KEYSWITCHES

THE KEYSWITCH CO.
ALL POST OFFICE EQUIPMENT
Enquiries to Sales Manager
126 KENSAL ROAD, LONDON, W.10
Telephone: LAD. 0666, 4640 Grams: "Fonequipt". London. W 10
Contractors to Home & Overseas Governments & H.M. Crown Agents

HILDICK & HILDICK
WALSALL TUBE WORKS
PLECK ROAD, WALSALL. Phone WAL. 2123

TRANSFORMERS
of all types up to 25 kVA for Single or Three Phase operation, Phase Conversion, etc.

INDUCTA

COILS
for Contactors, E.M. Brakes, Air Valves, etc. and COIL WINDINGS, for all purposes.

MAINS
Output, and Special Purpose Transformers for Radio Equipment, Chokes, etc.

SOLENOIDS
for A.C. and D.C. Operation. A.I.D. APPROVED.

W. F. PARSONAGE & Co LTD
INDUCTA WORKS
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Aeroflex

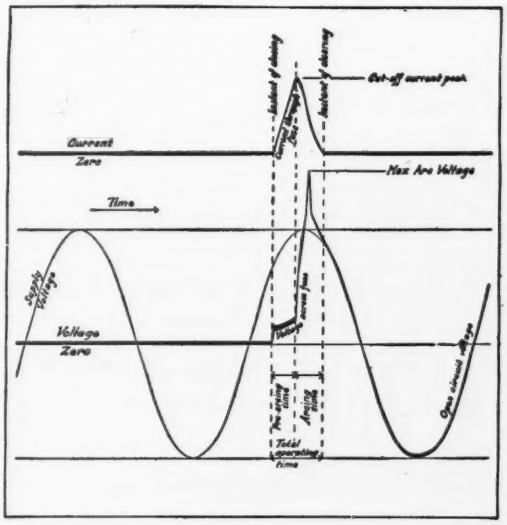
CLASS P CAT. 440 AC 5

ENERGY LIMITING

REWIREABLE CARTRIDGE FUSE LINKS

offer Advanced Characteristics

This new range of fuses represents the culmination of the practice, anticipated far in advance of their time, by the invention of Aeroflex High Breaking Capacity Fuses some 30 years ago. Known as the AD and FC types, the new fuses are fully interchangeable with their predecessors, the AF and CM patterns but have a proved Breaking Capacity of 46 KA and a standardised fusing factor of 1.25.



The diagram shows a typical form of a short circuit oscillogram of an Aeroflex fuse clearing a short circuit test. This theoretical performance has been completely substantiated by a number of ASTA Tests embodied in relevant certificates.

A full technical exposition of the subject, together with facsimile oscillograms, is contained in our publication C.F.2, copies of which are available on request.

REWIREABILITY : Fuse links are not discarded when blown — they can be returned for prompt replacement under our rewiring service scheme.

Parmiter Hope & Sugden Ltd.

MANCHESTER 12 • *London:* 34 Victoria Street, S.W.1

Glasgow: 5 Somerset Place, C.3 • *Birmingham:* 39/41 Carrs Lane 4

"Are you running a temperature... that's too high for your pocket?"

How much does your boiler house cost to maintain? Quite a considerable amount, no doubt—and this is where the G.E.C. can help you. They are experts in industrial water heating equipment, and you can save yourself this cost by installing a G.E.C. Storage Water Heater. The thermostatic control on the heater ensures that the water is kept at the required temperature; furthermore you will have no fuel storage problems, no fumes and dirt and no maintenance expenses. *For further information write for publication H.4.*

G.E.C. Electric storage water heaters

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

G22

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to First Post on Monday of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

BURGH OF OBAN

Street Lighting: Trunk Roads A.85 and A.816

TENDERS are invited for the installation of a system of street lighting units on the above roads, including the provision and erection of tubular steel columns, 25 ft. mounting height, provision and fixing of lanterns, together with lamps, control gear and ancillary works. Alternative tenders are required as follows:—

(a) 84 Fluorescent units
(b) 29 Fluorescent units
55 Mercury Vapour units

and also the dismantling and removal to Burgh Works Department of 35 existing street lighting units.

Specifications and schedules of quantities can be obtained on application to the Burgh Surveyor, Municipal Buildings, Oban, in whose office a plan of the layout can be seen.

Sealed offers marked "Trunk Road Lighting" to be lodged with the undersigned on or before Saturday, 5th October, 1957.

The acceptance of the successful tender is subject to the approval of the Ministry of Transport and Civil Aviation. The lowest or any offer may not be accepted.

A. MACINNES,
Municipal Buildings, Town Clerk.
Oban.
4th September, 1957. 7449

THE ELECTRICITY TRUST OF SOUTH AUSTRALIA

Port Augusta "B" Power Station

Water Treatment Plant

TENDERS are invited for the supply, delivery and erection of Water Treatment Plant for Nos. 1 and 2 Turbo-Alternators and Nos. 1, 2, 3 and 4 Boilers at the above Power Station.

Specifications are available at the offices of the Design Engineer, Hindmarsh Buildings, Grenfell Street, Adelaide, and Preece, Cardew & Rider, Consulting Engineers, 8, 10 & 12, Queen Anne's Gate, Westminster, London, S.W.1, from 13th September.

Tenders close on Tuesday, 19th November, at 9.30 a.m. (G.M.T.) in London and 5 p.m. (S.A.T.) in Adelaide. No tender will necessarily be accepted. Tenders must be submitted in triplicate, two copies being lodged with the Chairman, Purchasing and Contracts Committee, Electricity Trust of South Australia, Kelvin Buildings, North Terrace, Adelaide, South Australia, and one copy being lodged with Preece, Cardew & Rider, Consulting Engineers, 8, 10 & 12, Queen Anne's Gate, Westminster, London, S.W.1, by the closing times specified. 7405

COUNTY BOROUGH OF BOURNEMOUTH

Borough Engineer's Department

Main Road Lighting

TENDERS are invited for the supply, delivery and erection of 150 Lighting Units, 25 ft. mounting height, comprising 250-watt H.P.M.V. horizontal enclosed type, and 140-watt Sodium enclosed type side entry lamps.

Forms of tender obtainable from Borough Engineer, Town Hall.

Tenders to reach me by 5th October, 1957.

A. LINDSAY CLEGG,
Town Clerk. 7448

CITY OF NORWICH

Improvement of Street Lighting

Trunk Road A/1074, Lakenham Road, Barrett Road, Martineau Lane and Carrow Road; A.146 King Street and Bracondale

TENDERS are invited for:—

(1) Supply of 140-watt SO/H lanterns; 132 medium angle and 4 cut-off type.
(2) Control gear and lamps, 136 sets.
(3) Supply of 62 spun prestressed concrete and 74 tubular steel lamp columns.
(4) Erection and part connection 136 columns, etc.

Tenders may be submitted for items (1), (2), (3) or (4).

Copies of the tender documents may be obtained from the City Engineer, City Hall, Norwich. Drawings may be inspected during normal working hours at the City Engineer's office.

Completed tenders are to be received not later than 10 a.m. on Saturday, 28th September, 1957.

The council does not bind itself to accept the lowest or any tender. 7473

ELECTRICITY COMMISSION OF NEW SOUTH WALES

Quotation No. 5791

QUOTATIONS are invited for the supply of Control Grading Rings for use on the Commission's 330-kV transmission lines.

A total of 2,271 rings of several types is required to limit the radiated radio interference from the Commission's transmission lines in accordance with Specification No. T.60.

Copies of this specification together with drawings and tender documents may be obtained, free of charge, from the Agent General for New South Wales, 56/57, Strand, London, W.C.2.

Quotations must be delivered to the Electricity Commission of New South Wales, Kelvin House, 15, Castlereagh Street, Sydney, not later than 2 p.m. on Friday, 1st November, 1957, or to the office of the Agent General for New South Wales in London, not later than 5 p.m. on Thursday, 31st October, 1957. 7472

MALTA POWER STATION

4-MVA Auto-Transformer

TENDERS are invited by the Maltese Government for the supply and delivery c.i.f. Malta of one 4-MVA Auto-Transformer, ratio 11/6.9 kV, three-phase, 50 cycles, type "ON," suitable for indoor use.

Copies of the specification, form of tender and conditions of contract can be obtained from EM6 Dept., Crown Agents for Oversea Governments and Administrations, 4, Millbank, London, S.W.1, by application on payment of £3 for a set of three documents and quoting the reference "Contract EM.1715/4."

Completed and sealed tenders tenders in duplicate in a plain envelope and bearing the appropriate reference must be delivered at the Office of the Treasurer and Director of Contracts, The Palace, Valletta, Malta, G.C., not later than 10 a.m. 10th October, 1957. 7428

LANCASHIRE COUNTY COUNCIL

To Electrical Contractors

Tenders for Electrical Installations

THE Lancashire County Council Standard Specification of Electrical Installations is at present being revised, and as from the 1st October, 1957, tenders for electrical work will be invited in accordance with the revised specification. 7406

SITUATIONS VACANT

CITY OF SALISBURY, SOUTHERN RHODESIA

Power Station Operating Staff Vacancies

APPLICATIONS are invited for the following fixed establishment posts in the Electricity Department of the above Municipality.

(a) ASSISTANT SHIFT CHARGE ENGINEERS on the salary scale £1,350 × £50 to £1,500 per annum.
(b) SHIFT CONTROL TECHNICIANS on the salary scale £1,150 × £50 to £1,200 × £50 to £1,300 per annum, with efficiency barrier at £1,200 per annum.

Applicants for the first position must have completed an approved course of technical education in electrical and mechanical engineering. The possession of appropriate technical qualifications will be an advantage.

Applicants for both positions must have had considerable practical experience in the operation of steam power station plant in a responsible position, and experience of control room duties on an interconnected system will be a recommendation.

The above appointments are subject to the Council's service and leave regulations as amended from time to time.

The salary payable will commence at the minimum of the grade applicable to the post, rising by annual increments to the maximum salary of the grade, subject to an efficiency barrier in the case of the position of Shift Control Room Technician.

No cost-of-living, shift or other allowances are payable.

Candidates should indicate whether or not their application is limited to the senior post.

The successful candidates must be able to comply with the regulations of the Southern Rhodesia Immigration Authorities, and will be required to submit satisfactory medical certificates.

Applicants, who should be not more than 45 years of age, are required to submit full particulars of their technical education, qualifications (if any), training and experience, giving details of positions held and salaries received, marital state, age, place of birth and nationality. Copies of not more than three recent testimonials may be included.

Canvassing, directly or indirectly, will be a disqualification.

Further particulars regarding the undertaking, conditions of service, contributions towards travelling and removal expenses, etc., may be obtained from Davis & Soper Limited, 52 & 54, St. Mary Axe, London, E.C.3, to whom applications should be sent to arrive at their offices not later than 4th October, 1957. 7412

MANAGING DIRECTOR

APPLICATIONS are invited for the position of MANAGING DIRECTOR to a small well-established company in Home Counties, manufacturing electrical accessories. Vacancy is due to sudden death of founder and owner. Capital is available for further expansion.

Applicants should be age 36/48 and have a recognised engineering qualification, together with experience in both commercial and production management. Envisaged remuneration £2,500 to £4,000 with interest in results.

Written application to Box DCD, Jacob, Cavenagh & Skeet, Chartered Accountants, 37, Norfolk Street, London, W.C.2. 7413

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following vacancies in this Division :—

SHIFT CONTROL ENGINEER, COVENTRY POWER STATION (Vacancy No. 152/57/ER).

Applicants should possess a sound technical training and have practical experience in the control of steam generating plant and the operation of switchgear.

Salary will be in accordance with Class G, Grade 10 (£790-£835 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 25th September, 1957.

STATION SHIFT CONTROL ENGINEERS, WILLINGTON "A" POWER STATION (Vacancy No. 154/57/ER).

Applicants should be suitably qualified engineers who have had experience in control and operation of large turbo-alternators.

Salary will be in accordance with Class K, Grade 10 (£935-£995 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 25th September, 1957.

SECOND ASSISTANT CHEMIST, NORTH WILFORD POWER STATION (Vacancy No. 151/57/ER).

Candidates must have had a sound technical training and some previous experience in a power station laboratory. The Ordinary National Certificate in Chemistry is regarded as the minimum qualification for this post, but preference will be given to holders of the Higher National Certificate.

Salary will be in accordance with Class K, Grade 11 (£885-£930 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25th September, 1957.

ASSISTANT SHIFT CHARGE ENGINEER, WARWICK POWER STATION (Vacancy No. 155/57/ER).

Applicants should preferably hold the Higher National Certificate and have had experience in a modern power station.

Salary will be in accordance with Class E, Grade 9 (£740-£785 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25th September, 1957.

THIRD ASSISTANT ENGINEERS (Electrical), GENERATION (Construction) DEPT. (Vacancy No. 153/57/ER).

Applicants should have had a fundamental training in electrical engineering, including workshops, and should preferably have had experience in the manufacture, erection and maintenance and operation of electrical plant as installed in modern power stations. Preference will be given to candidates who possess a degree or are Graduate Members of the Institution of Electrical Engineers.

Salary will be within Class AX/EX, Grade 4 (£895-£1,140 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25th September, 1957.

SENIOR ASSISTANT ENGINEER, GENERATION (Operation) DEPT., DIVISIONAL HEADQUARTERS (Vacancy No. 156/57/ER).

Candidates must have served an indentured apprenticeship, preferably in a large engineering works, and have received technical training to Higher National standard in mechanical and/or electrical engineering.

Experience in power station operation and/or the preparation of contract specifications will be an advantage.

Salary in accordance with Class AX/EX, Grade 1 (£1,330-£1,595 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25th September, 1957.

SENIOR DRAUGHTSMAN, TRANSMISSION DRAWING OFFICE, DIVISIONAL HEADQUARTERS (Vacancy No. 136/57/ER).

Duties will include work on electrical layouts and diagrams in the transmission drawing office. Experience on H.V. electrical equipment preferred but not essential.

Salary will be in accordance with Grade 5 (£760-£860 per annum) of the Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications, 2nd October, 1957.

GENERAL ASSISTANT ENGINEERS, WILLINGTON, STAYTHORPE AND OTHER LARGE GENERATING STATIONS (Vacancy No. 158/57/ER).

Applications are invited from suitably qualified young men who are interested in generating station operation and/or maintenance as a career.

Facilities are available whereby experience can be obtained in all sections of a large modern generating station, and the prospects of advancement are real to those who are willing to take advantage of the opportunities.

The salary during the initial training period will depend upon qualifications and knowledge and will be within the range £540-£730 per annum.

Closing date for receipt of applications, 2nd October, 1957.

SENIOR DRAUGHTSMAN (Civil), GENERATION (Construction) DEPT. (Vacancy No. 159/57/ER).

Candidates should have experience in the preparation of detail drawings and in the design of one or more of the following subjects :—

Reinforced concrete structures.
Piled and slab foundations for heavy components.
Cable subways, bridges and culverts.

SENIOR DRAUGHTSMAN (Electrical), GENERATION (Construction) DEPT. (Vacancy No. 160/57/ER).

Candidates should have experience in the preparation of layouts and diagrams for the installation of E.H.T. and L.T. switchgear, transformers, E.H.T. and L.T. cables; knowledge of protective gear systems would be an advantage.

SENIOR DRAUGHTSMAN (Mechanical), GENERATION (Construction) DEPT. (Vacancy No. 161/57/ER).

Candidates should have experience on one or more of the following :—

(i) Design and layout of power station equipment, including turbo-alternators, boiler plant, coal and ash plant and general station auxiliaries.

(ii) H.P. and L.P. steam and feed pipework. Condensing plant and feed heating systems.

(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Salaries for vacancies 159/57, 160/57 and 161/57 will be within Grade 4 (£895-£995 per annum) or Grade 5 (£760-£860 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications, 2nd October, 1957.

These appointments will be pensionable within the provisions of the Central Electricity Authority and Area Boards (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.

4th September, 1957. 7433

NATIONAL COAL BOARD

ASSISTANT ENGINEER (Mechanical) required by N.C.B.'s Power Generation Branch (Production Dept.) at London H.Q. Experience in the design and construction or operation of steam power plants essential, preferably with some knowledge of gas turbines. Experience in preparation of specifications and negotiations of contracts is desirable.

Appointment (superannuable), according to qualifications and experience, within inclusive range £814 - £1,414.

Write for application form to Staff Dept. (X/893C), National Coal Board, Hobart House, London, S.W.1, before 20th September, 1957. 7410

YORKSHIRE ELECTRICITY BOARD

No. 1 (Bradford) Sub-Area

PRINCIPAL ASSISTANT (Purchasing and Stores).

Applicants should have had experience in purchasing stores and equipment normally associated with electrical distribution work, service centre sales and office supplies. They must be capable of taking complete charge of the purchasing section, including the maintenance of records, order and invoice procedure, stock control, supervision of stores staffs including manual workers, and the normal routine clerical work of a purchasing and stores section.

Salary N.J.C. Grade 7, £1,035/£30/£1,125 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45/53, Sunbridge Road, Bradford, not later than 27th September, 1957.

No. 3 (Sheffield) Sub-Area
ROTHERHAM AND MEXBOROUGH DISTRICT

ASSISTANT CONSUMERS' ENGINEER.

Applicants should have had a sound practical training in the electricity supply or electrical contracting industry, and should preferably have qualifications leading to Corporate Membership of the Institution of Electrical Engineers. They should have experience of general load development in the industrial, space heating and catering fields, be fully conversant with the wiring rules and regulations of the Institution of Electrical Engineers, be capable of preparing electrical schemes and specifications and have had experience of controlling staff and workpeople.

Salary N.J.B. Class K, Grade 10, £935/£20/£995 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 27th September, 1957.

No. 4 (Leeds) Sub-Area
LEEDS DISTRICT

FOURTH ASSISTANT DISTRICT ENGINEER.

Applicants should be Graduates of the Institution of Electrical Engineers and have experience in the construction, operation and maintenance and design of overhead and underground distribution systems in a densely populated industrial and residential area.

Salary N.J.B. Class K, Grade 11, £885/£15/£930 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Nr. Leeds, not later than 27th September, 1957.

No. 7 (Grimsby) Sub-Area
GRIMSBY DISTRICT

THIRD ASSISTANT DISTRICT ENGINEER.

Applicants should be of Higher National Certificate standard in Electrical Engineering and have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground systems, substation plant and ancillary equipment.

Salary N.J.B. Class F, Grade 9, £790/£15/£835 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 27th September, 1957. 7481

NORTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER, SUB-AREA ENGINEER'S DEPARTMENT, OLDHAM.

Applicants should have experience in the operation and maintenance of large industrial and rural networks, both underground and overhead, operating at voltages up to and including 33 kV, together with the associated substation equipment.

Salary scale £935 × £20 to £995 p.a., Grade K.10. N.J.B. conditions.

Applications, naming three referees, to Sub-Area Manager, North Western Electricity Board, No. 3 Sub-Area, Union Street, Oldham, by 21st September, 1957. 7434

CENTRAL ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointments in the Technical (Electrical) Department:—

FOURTH ASSISTANT ENGINEER (Research and Special Testing), DIVISIONAL HEADQUARTERS.

Salary Class AX/DX, Grade 5, £810 × £25 to £935/£1,010 per annum plus London weighting.

Applicants should possess qualifications necessary for Graduate Membership of the Institution of Electrical Engineers. The successful applicant will be required to assist in applied research and special testing concerning electrical plant in high voltage switching, transforming and generating stations. Electrical measurement and electronic experience is desirable.

The successful applicant will be required to reside within a reasonable distance of Cockfosters.

FOURTH ASSISTANT ENGINEER, FINCHLEY (West) REGION.

Salary Class AX/DX, Grade 5, £810 × £25 to £935/£1,010 per annum plus London weighting.

FOURTH ASSISTANT ENGINEER, IPSWICH REGION.

Salary Class AX/DX, Grade 5, £810 × £25 to £935/£1,010 per annum.

The duties for both of the above positions include the commissioning and maintenance of electrical plant and protective gear in generating and transforming stations. Applicants should be sufficiently experienced to undertake commissioning work of new plant with a minimum of supervision.

These appointments will provide a basis for promotion to a higher technical grade and applicants should possess qualifications of the standard required for Graduate Membership of the Institution of Electrical Engineers.

The area covered by Finchley (West) Region includes Hemel Hempstead, Aylesbury, Elstree, Watford, Harrow and Finchley; for Ipswich Region includes King's Lynn, Norwich, Great Yarmouth, Ipswich and Colchester.

The applicants appointed will be required to reside in the Finchley of Ipswich districts.

TWO FOURTH ASSISTANT ENGINEERS, LUTON REGION.

Salary Class AX/DX, Grade 6, £710 × £25 to £835/£910 per annum.

FOURTH ASSISTANT ENGINEER, FINCHLEY (West) REGION.

Salary Class AX/DX, Grade 6, £710 × £25 to £835/£910 per annum plus London weighting.

The duties of both of the above positions include assisting in the commissioning and maintenance of electrical plant and protective gear in generating and transforming stations.

These appointments will provide a basis for promotion to a higher technical grade and applicants should possess qualifications of Higher National Certificate standard.

The applicants appointed will be required to reside in either the Bedford, Luton or Finchley districts.

FOURTH ASSISTANT ENGINEER (Section), TRANSMISSION DEPARTMENT, BEDFORD SECTION.

Salary Class AX/DX, Grade 5, £810 × £25 to £935/£1,010 per annum.

The commencing salary will depend upon the qualifications and experience of the successful applicant, who will be required to reside in the vicinity of Bedford.

Applicants should preferably hold a Corporate or Graduate Membership of the Institution of Electrical Engineers, or equivalent qualifications, and have experience in the construction or operation and maintenance of high voltage overhead lines, cables and substation equipment up to 132 kV.

GENERAL ASSISTANT ENGINEERS, LITTLE BARFORD GENERATING STATION.

Salary Class G, within the range of Grades 15/13, £540 × £15 to £680 per annum plus 10% shift allowance.

The commencing salary will depend upon the duties and responsibilities.

Duties of the above post include assisting in the electrical control room and experience in the technical operation of electrical, boiler house, and turbine house plant, testing, etc., in a generating station and provide a suitable basis for promotion to higher technical grades.

Manual workers in skilled grades with suitable technical training will be considered. Previous experience in a generating station and/or technical training to the standard of Ordinary National Certificate or its equivalent will be of advantage.

Applications, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Authority, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 28th September, 1957.

W. N. C. CLINCH,
Controller.

7469

ENGINEERS

interested in

SEMI-CONDUCTOR DEVELOPMENT

are invited to write for a discussion of the following vacancies:—

ELECTRICAL ENGINEER (Ref. C.22).

Deputy Group Leader for a development team concerned with the evaluation of a wide range of silicon power rectifiers and allied devices. The work will include rating studies, environmental testing and circuit application work, particularly with respect to high power rectifiers.

Degree or equivalent. Experience of semi-conductors, mercury arc rectifiers or valve applications preferred.

ELECTRICAL/MERCHANICAL ENGINEER (Ref. C.23).

To assist in the design and development of housing and cooling systems for rectifiers, with particular emphasis on high powers.

The work will involve close working with a team of physicists engaged on the problems of processing the semi-conductor elements. A degree or equivalent is essential. Knowledge of the physics of heat flow and experience in the design of electronic or small electrical components or assemblies an advantage.

Salaries are highly competitive, and prospects in this young and expanding division are good.

A non-contributory pension scheme is operated.

Housing accommodation is available in the New Town if required.

Informal discussions can be arranged in London or Harlow.

Please write, quoting appropriate reference number, to:—

Personnel Manager,
STANDARD TELEPHONES AND CABLES LIMITED,
Rectifier Division,
Edinburgh Way, Harlow, Essex.

7464

SALES ENGINEER

to handle the sale of mining cables and electrical equipment to the mining and quarry industries in the North of England.

Technical training should preferably be to Graduate or Higher National Certificate standard in electrical engineering, and applicants should be in the age range 25/35 years. Previous experience in the mining industry would be an advantage.

Applications should be as detailed as possible and addressed to :—

Works Personnel Officer
(Reference P/13)
BRITISH INSULATED CALLENDER'S CABLES LIMITED
Prescot, Lancs.

7454

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Worcester and District Sub-Area

FIRST ASSISTANT DISTRICT ENGINEER (Worcester and Malvern District).

Applicants should have had a sound technical training and wide practical experience in the planning, construction, operation and maintenance of high and low voltage overhead and underground distribution systems. Technical qualifications desirable. Salary £995/£1,055 per annum (N.J.B. Grade F.5).

Apply by letter, within fourteen days, stating age, qualifications, experience, present position and salary to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

Birmingham and District Sub-Area

FOURTH ASSISTANT ENGINEER AND GENERAL ASSISTANT ENGINEER (Technical and Planning Section) (Headquarters).

The successful applicants will be required to assist in the design of the H.V. and M.V. systems, analysis of loading conditions, the preparation of specifications, layout of plant and equipment and the technical investigations. Technical qualifications desirable. Salary, Fourth Assistant Engineer (N.J.B. Grades M.13/12, £885/£995 per annum), General Assistant Engineer (N.J.B. Grades M.18/14, £635/£880 per annum) according to qualifications and experience.

Apply by letter, within fourteen days, stating age, experience, present position and salary to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4.

Central Gloucestershire Sub-Area

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER (Dean Forest District).

Applicants should have had a sound technical training with wide practical experience in the sale and installation of domestic and commercial electrical equipment and the work associated therewith. The successful applicant will be required to assist in all branches of commercial work, including advising consumers on domestic, commercial and industrial equipment, estimating and contracting work. Technical qualifications desirable. Salary £685/£730 per annum (N.J.B. Grade E.10).

Apply by letter, within fourteen days, stating age, qualifications, experience, present position and salary to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126, London Road, Gloucester.

Wolverhampton and District Sub-Area

SENIOR SERVICE CENTRE ASSISTANT (Male) (Lichfield District).

Duties include the promotion of sales of electricity and electrical apparatus. Experience essential. Salary £615/£675 per annum (N.J.C. Grade 2).

Apply by letter, within fourteen days, stating age, experience, present position and salary to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton.

A. STEPHENS,
Secretary.

7475

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Tyne Sub-Area

DISTRICT COMMERCIAL ENGINEER, Gateshead. Salary, Schedule A, Class F, Grade 3, £1,160/£1,235. N.J.B. conditions of service.

Wear Sub-Area

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER, Consett District (Stanley Service Centre). Duties include commercial and domestic development and the application of electricity to farming. Graduate Membership I.E.E. and/or H.N.C. desirable. Salary, Schedule A, Class E, Grade 9, £740/£785. N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 7479

***Situations Vacant** (continued)*

SOUTH EASTERN ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER, Sevenoaks and Reigate District.

Commencing salary £685 to £790 p.a. under N.J.B. Agreement Class F, Grades 11 to 9, according to qualifications, experience and ability. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems, preferably up to 33 kV. The position entails standby duties. The successful applicant will operate from District Office, Oxted, and his duties will cover any point within the district's area.

Applications, naming two referees, to H. F. Gill, District Manager, SEEBOARD, Electric House, West Hill, Oxted, by 25th September, 1957.

SHOWROOM ASSISTANT (Male), Kingston and District.

Salary £615-£675 p.a. plus London weighting under N.J.C. Grade 2. Superannuable. Applicants must have knowledge of electrical appliances and should be experienced in general showroom and cashier duties and have the ability and initiative to promote sales. Appointment is primarily for Surbiton showroom, but the person appointed must be prepared to work in any of the Kingston and District showrooms. Applicants who applied for the Grade 1 vacancy need not reapply.

Applications, naming two referees, on forms from D. C. Thomson, B.Sc., M.I.E.E., Kingston and District Manager, SEEBOARD, 22, Claremont Road, Surbiton, Surrey, by 25th September, 1957.

SECOND ASSISTANT DISTRICT ENGINEER, Guildford District.

Salary £835 × £15 to £880 per annum under N.J.B. Class E, Grade 7. (The number of units sold to consumers is approaching the maximum for Class E). Superannuable. Applicants should preferably be Corporate Members of the Institution of Electrical Engineers. The successful candidate will be expected to take a responsible part in planning, construction and operation of underground and overhead systems of a large rural and urban network. The ability to organise work and control staff is essential.

Applications, naming two referees, on forms from W. E. Affleck, M.I.E.E., M.Inst.F., Guildford Manager, SEEBOARD, 99, High Street, Guildford, by 25th September, 1957.

THIRD ASSISTANT DISTRICT ENGINEER, Croydon and Purley.

Salary £885 × £15 to £930 p.a. under N.J.B. Schedule Class H, Grade 9, plus London weighting.

Applicants should be qualified engineers with experience of planning, construction and maintenance of underground and overhead systems preferably up to 33 kV.

The person appointed will be required to undertake standby duties.

Applications, naming two referees, on forms from H. Lowe, M.I.E.E., District Manager, SEEBOARD, Electric House, Wellesley Road, Croydon, by 25th September, 1957.

A. L. BURNELL,
Secretary.

7482

B I C C

THE Submarine Power Cable Contracts Department of British Insulated Callender's Construction Co. Ltd. has vacancies for

ASSISTANT CONTRACT ENGINEERS

to participate in the installation of submarine power cable at home and overseas.

Applicants must be physically fit, and below the age of 35, and be prepared to serve in any part of the world for reasonable periods.

Previous experience in the cable industry is desirable but not essential, and engineering qualifications of Higher National or equivalent status would be considered an advantage.

This rapidly expanding branch of the engineering profession offers great opportunities for younger men who are prepared to show enterprise and initiative.

Salaries will be commensurate with age and qualifications, and overseas allowances will be paid during periods spent abroad.

Apply in writing to Personnel Officer (Staff), British Insulated Callender's Construction Co. Ltd., 30, Leicester Square, London, W.C.2.

7430

SYLVANIA-THORN

Colour Television

LABORATORIES LTD.

require

1. AN ELECTRICAL ENGINEER to take charge of sales acceptance and life testing of semiconductor diodes and transistors. He will be responsible for drawing up specifications of these devices from a basis of design and life test information. A thorough understanding of test procedure and techniques will be necessary, and some experience in a similar capacity, either in valves or semiconductors, would be a distinct advantage. A technical standard of H.N.C. or Pass Degree is desirable, but consideration will be given to otherwise suitable applicants.

2. A QUALIFIED ELECTRICAL ENGINEER to lead a section engaged on the application problems of heavy duty germanium and silicon rectifiers. Some power engineering experience is necessary particularly in the field of rotating machinery and heavy current A.C./D.C. converters. He will be responsible for the specification of overload ratings, and suitable safety measures in all high power applications. It will be necessary to maintain close liaison with customers as well as to superintend a section engaged on experimental investigations. This is a post of considerable responsibility and will carry a commensurate salary.

3. AN ELECTRICAL OR ELECTRONIC ENGINEER to join a section which is engaged mainly on digital applications of transistors. Previous experience in the computer field, either with valves or transistors, would be considered an advantage. The work will involve circuit problems on date processing and computation together with the design of associated logical circuits. The successful applicant will receive a minimum of direct supervision, and will have every opportunity and encouragement to develop his own ideas.

4. AN ELECTRONIC ENGINEER for a section engaged on instrumentation in the semiconductor field. A wide variety of problems are likely to arise which will range from the evaluation of semiconductor crystal properties to the measurement of device parameters. Instrumentation will be carried out using transistors as active elements, and will provide useful application experience in this field. Previous experience in either instrumentation or transistor application would be an advantage, but consideration will be given to those who wish to develop in this direction.

5. AN ENGINEER of O.N.C. standard to assist in the life test of semiconductor devices and the consequent preparation of test specifications. It will be necessary to make routine measurements from time to time and to tabulate results for evaluation purposes. This post carries the opportunity of gaining experience throughout the semiconductor field and specialised training will be given. Further study with a view to obtaining H.N.C. will be made possible.

These positions are permanent and progressive and carry entrance to Contributory Pension and Life Assurance Fund.

Apply in writing, quoting advertisement number, to:—

B. C. Fleming-Williams,

SYLVANIA-THORN COLOUR T/V LABORATORIES LTD.

Gt. Cambridge Road, Enfield.

7466

CENTRAL ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions:—

THIRD ASSISTANT ENGINEER, TECHNICAL DEPARTMENT, PORTSMOUTH (S/13,944).

The department deals with electrical problems associated with the construction and operation of generating stations and substations.

Applicants should have an interest in the characteristics of alternators and motors and their performance under all operating conditions. The wide range of problems dealt with in the department would offer an excellent opportunity for such a person to widen his knowledge and experience.

Preference will be given to those who are Graduates of the Institution of Electrical Engineers or who possess an equivalent qualification.

Salary N.J.B. AX/CX Grade 4, £895-£1,080.

GRADE 12 ENGINEERS, MARCHWOOD GENERATING STATION (S/13,945).

The new Marchwood Generating Station is situated near Southampton. These vacancies offer an excellent opportunity to gain experience leading to further promotion within the industry. Previous experience of modern generating station plant is desirable. Applicants should have had a sound technical training and should possess or be studying for qualifications leading to Corporate Membership of an appropriate professional institution.

Salary N.J.B. K/12, £835 × £15 to £880.

FOURTH ASSISTANT ENGINEER, TECHNICAL DEPARTMENT (S/13.946).

Applicants should have had some general experience of work in a technical department and possess or be studying for qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

Salary N.J.B. AX/CX Grade 6, £710-£885.

Special application forms, obtainable only from P. D. A. Oliver, Divisional Secretary, Central Electricity House, High Street, Portsmouth, should be returned by the 25th September, 1957. 7476

CITY OF SALISBURY, SOUTHERN RHODESIA

Electricity Undertaking

Vacancy for Test Room Assistant (Meters)

APPLICATIONS are invited for the fixed establishment post of TECHNICAL ASSISTANT, GRADE 2, in the Test Section of the above-mentioned undertaking. Salary scale is £1,100 × £50 to £1,250 p.a., commencing salary at the minimum. No cost-of-living or other allowances are payable.

Applicants must be thoroughly experienced in all types of meter testing, particularly high-tension, transformer-operated, polyphase equipments, both kW and kVA, and should be capable of carrying out all duties in connection with a standardising laboratory.

The main duties of this post are :—

(a) Testing and calibrating high-tension and special types of metering.
(b) Standardising instruments and substandard meters against potentiometer equipment.
(c) Ratio and phase angle testing of instrument transformers.
(d) Testing all types of instruments and meters, and general supervision of metering work.

The successful candidate must be able to comply with the requirements of the Immigration Authorities, and will be required to submit to the Council a satisfactory medical certificate of fitness.

Applicants should submit full particulars of their technical education, qualifications (if any), training and experience. Details of age, place of birth, nationality and marital state should be given, and copies of not more than three recent testimonials may be included.

Further particulars regarding conditions of service, leave entitlement, allowances towards travelling and removal expenses, etc., are obtainable from Davis & Soper Ltd., 52 & 54, St. Mary Axe, London, E.C.3, to whom applications must be submitted on or before 27th September, 1957. 7342

APPLICATIONS are invited for pensionable posts as

EXAMINERS

in the

PATENT OFFICE

to undertake the official scientific, technical and legal work in connexion with Patent applications.

Age at least 21 and under 35 years on 1st January, 1957, with extension for regular Forces' service.

Candidates must have (or obtain in 1957) 1st or 2nd Class Honours in Physics, Organic or Inorganic Chemistry, Mechanical or Electrical Engineering or in Mathematics, or an equivalent qualification, or have achieved a professional qualification, e.g., A.M.I.C.E., A.M.I.Mech.E., A.M.I.E.E., A.R.I.C. For a limited number of vacancies candidates with 1st or 2nd Class Honours degrees in other subjects—scientific or otherwise—will be considered. Exceptionally candidates otherwise qualified by high professional attainments will be considered.

Starting pay for 5-day week of 42 hours in London between £605 and £1,120 (men) according to postgraduate (or equivalent) experience and National Service. Maximum of scale £1,345. This salary scale is being increased by approximately 5 per cent. Women's pay above £605 slightly lower but is being raised to reach equality with men's in 1961. Good prospects of promotion to Senior Examiner rising to £2,000 (under review) and reasonable expectation of further promotion to Principal Examiner.

Application form and further particulars from Civil Service Commission, Scientific Branch, 30, Old Burlington Street, London, W.1, quoting S.128/57 and stating date of birth.

Interview boards will sit at intervals, as required. Early application is advised. 7409

JOSEPH LUCAS (ELECTRICAL) LTD.

Great King Street, Birmingham

AS a result of expansion of our road vehicle lighting development department to meet the growing demands of the motor industry we have vacancies for

ENGINEERS AND PHYSICISTS

of at least H.N.C. standard to work on the following projects. Experience or knowledge of photometric and electrical instruments desirable.

The design and development of vehicle lighting equipment and in particular the development of optical systems for future projects.

Development work on specific problems related to vehicle lighting equipment and the design of laboratory and factory control equipment for these products.

In addition there are vacancies for SENIOR DESIGNERS required to work in close co-operation with car designers and styling engineers on the design of lighting equipment for new car models. Experience in the design of pressed metal components for large quantity production desirable.

All of these positions carry attractive starting salaries and provide excellent prospects for advancement. Staff pension fund.

Apply in writing, stating age, qualifications and experience, to the Personnel Manager, Joseph Lucas (Electrical) Limited, Great King Street, Birmingham, 19, quoting reference PM/D/156.

127

SOUTH WALES ELECTRICITY BOARD

ASSISTANT ENGINEER required, District 344 (Merthyr) in the Central Sub-Area of the Board.

Salary Class F, Grade 11 (£685/£730) of the N.J.B. Schedule.

Applications stating age, present position and salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Monday, 23rd September, 1957. 7450

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

STATION SHIFT CONTROL ENGINEER is required at Meaford A Power Station, Nr. Stone, Staffs. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade G.10, £790-£835 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the control of steam generating plant and main switchgear are required. Appropriate technical qualifications an advantage.

Apply quoting vacancy number 633MD, on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 25th September, 1957. 7477

METAL INDUSTRIES GROUP OF COMPANIES

BROOKHIRST SWITCHGEAR LIMITED, CHESTER

BROOKHIRST SWITCHGEAR Limited, of Chester, which for more than half a century has been a leader in the motor control industry, and lately engaged in major works in connection with nuclear power schemes, requires the services of a

GENERAL MANAGER.

The General Manager will be the chief executive officer of the company and directly responsible to the Board.

Applicants should be between the ages of 35 and 50, and have had a wide experience in the administration of industrial enterprises. Knowledge of the motor control gear industry would be regarded as an additional qualification.

The salary offered for this responsible appointment is

£4,000 PER ANNUM UPWARDS,

according to experience. The successful candidate will be required to join the Metal Industries Pension Fund. Removal expenses would be allowed.

Application forms may be obtained from the Chairman, Brookhirst Switchgear Limited, Newry Park, Chester.

7411

THE REED PAPER GROUP

have a vacancy for a

PURCHASING OFFICER

for Electrical Equipment

who will be responsible for obtaining quotations, arranging contracts and buying electrical equipment for the Group. The possession of H.N.C. in Electrical Engineering or its equivalent are essential qualifications as is a thorough practical knowledge of the electrical trade. Preference will be given to candidates who have served a recognised apprenticeship. The age range is strictly 35-45.

These qualifications must match the ability to meet higher executives together with the ability to accept further responsibility within a fairly short time.

Excellent conditions of service are offered including non-contributory pension scheme and assistance with house purchase. Applicants with the necessary qualifications should apply with full details of experience to the Personnel Officer, Group Personnel Division, Albert E. Reed & Co. Ltd., Larkfield, Near Maidstone, Kent, quoting ref. POEE/67.

7463

SOUTHERN ELECTRICITY BOARD

Third Assistant Engineer (Planning)

NO. 2 (Newbury) Sub-Area Office. Salary N.J.B. Class L, Grade 10 (£995 × £20 to £1,055 per annum). N.J.B. conditions of service.

The duties of the post will be to assist in the Planning Section, principally on the detailed planning of, and scheduling of equipment for, major substations. Applicants should possess suitable technical qualifications.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, and returned to him in envelopes suitably endorsed, not later than 23rd September, 1957.

Assistant Engineer (Mains Maintenance)

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class E, Grade 10 (£685 × £15 to £730 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed not later than 23rd September, 1957.

The successful candidates for the above appointments will be required to contribute to the C.E.A. and Area Boards (Staff) Superannuation Scheme, if eligible. 7480

CITY AND COUNTY OF KINGSTON UPON HULL

Water Department

Station Superintendent

APPLICATIONS are invited for the post of STATION SUPERINTENDENT at a large pumping station.

Applicants should be particularly experienced in the running and maintenance of alternators, associated switchgear and electric motors, with sound general knowledge of diesel engines and centrifugal pumps.

The salary is at the maximum increment Miscellaneous Grade VI of the National Joint Council's Scales, viz. £725 per annum.

The person appointed will be required to take complete charge and reside at the station.

The appointment will be subject to the Local Government Superannuation Act, 1937, and to the passing of a medical examination.

Applications stating age, details of experience, together with copies of two recent testimonials, should be forwarded to the undersigned not later than 10 a.m., 23rd September, 1957.

Canvassing a member of the City Council or Chief Official will be a disqualification.

T. H. JONES, M.I.C.E.,
Water Engineer and Manager.

Water Department,
Alfred Gelder Street,
Kingston upon Hull. 7484

TELEPHONE MANUFACTURING COMPANY LTD.

Martell Road, West Dulwich, London, S.E.21

have vacancies for SENIOR and JUNIOR DEVELOPMENT ENGINEERS to work on—

(a) Design of circuits for automatic and manual telephone equipment.

(b) Design of light electro-mechanical apparatus.

Senior engineers must have the qualifications and experience required for Associate Membership of the Institution of Electrical Engineers, or have had not less than seven years' experience in the telephone industry in a position of responsibility.

Salary range £900 to £1,500 per annum.

Junior engineers must have H.N.C. or equivalent or O.N.C. with five years' adult experience in the telephone industry.

Salary range £600 to £1,000 per annum.

A limited number of trainee appointments are also available for young men with good examination results who wish to be employed on a part-time basis while studying for higher qualifications.

Pension and dividend bonus scheme in operation after qualifying period. Write, giving full details of age, experience, etc., to the Personnel Manager. 7465

Situations Vacant (continued)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

First Assistant District Engineer, Hamilton District

APPLICATIONS are invited for the above appointment. Applicants should preferably be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications. They should have had a sound engineering training with subsequent experience in the maintenance and operation of H.V. and L.V. switchgear, together with experience in H.V. and L.V. fault location. Candidates should also be conversant with the preparation of load flow diagrams and voltage drop calculations.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Schedule A; the present classification and grading being E.4, salary £995/£1,055 per annum, which will be subject to the statutory deductions, including superannuation. The successful candidate will require to reside within a reasonable distance of the district offices at Hamilton, and to take part in standby duty in accordance with the above Agreement.

Application forms, which may be obtained from the undersigned, should be forwarded to this office within 14 days of the date of this advertisement.

DUGALD SMITH.
Manager.

137, Almada Street,
Hamilton. 7483

CITY OF BELFAST

Development Assistant, Class III, Electricity Department

APPLICATIONS are invited for the above post. Applicants, not more than 35 years of age, must hold the Higher National Certificate in Electrical Engineering or possess equivalent qualifications. They must have had a sound engineering training followed by good experience of electrical installation practice, and be capable of dealing with matters relating to the utilisation of electricity generally.

Weekly wages equivalent to Grade 12, Class J, of the N.I.J.B. Schedule, viz. £790 × £15 to £835 per annum.

Upon completion of twelve months' satisfactory service, the position will be established on the salary list.

Superannuation contributions of approximately 6% of remuneration will be payable. Reciprocal pension arrangements exist between the Corporation and certain other Public Authorities.

Canvassing will disqualify.

Application forms obtainable from the Electricity Department, East Bridge Street. Completed applications must reach the undersigned by 4th October, 1957.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast,
P.O. Box 234,
5th September, 1957. 7468

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

First Assistant District Commercial Engineer

APPLICATIONS are invited for the position of FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER in the Newlands District.

Applicants should be engineers with commercial experience and preferably should hold an appropriate engineering qualification.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Schedule A, classification and grading F6. Salary £935/£995 per annum.

The successful applicant will require to reside within a reasonable distance of the Newlands District Office.

Forms of application, which may be obtained from the undersigned, should be forwarded to this office within 14 days of the date of this advertisement.

DUGALD SMITH,
Manager.

137, Almada Street,
Hamilton. 7436

CENTRAL ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

STATION SHIFT CONTROL ENGINEER, BLACKWALL POINT POWER STATION (Vacancy No. 57/828).

Sound technical training necessary followed by practical experience in the control and operation of modern generating plant and E.H.T. switchgear. Salary Class F, Grade 10 = £780 plus £74 shift p.a.

ASSISTANT SHIFT CHARGE ENGINEER, BARKING A/B POWER STATIONS (Vacancy No. 57/829).

Sound technical training necessary and practical experience in the control and operation of plant in a modern power station, including P.F. and chain grate boilers, and experience in the control of personnel. Salary Class L, Grade 9 = £1,115 plus £106 10s. shift p.a.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland Street, London, W.1, and be received within 10 days of this advertisement. 7432

AUTOMATIC TELEPHONE & ELECTRIC CO. LTD.

Installation Department

MEN required for the installation and commissioning of telephone exchange equipment, and various forms of communication, signalling, and control apparatus.

Applicants must be of practical turn of mind and must be willing to travel to any part of the country in accordance with the location of the contracts. Living allowance is given whilst on contract.

Experience with some form of electrical equipment and apparatus is necessary, together with sound knowledge of basic principles. Appropriate training will be given.

Please write quoting this advertisement and giving full details of age and experience to:—

Personnel Manager,
A. T. & E. CO. LTD.,
Strowger Works,
Liverpool.

7486

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the post of THIRD ASSISTANT ENGINEER in the Planning and Economics Section of the Chief Commercial Officer's Department at Board Headquarters.

Applicants should have had a sound engineering training to at least Higher National Certificate standard and should have had experience in the engineering or commercial departments of an electricity supply undertaking.

The duties will comprise general work on the economics of electrical generation and supply, including the collection and interpretation of technical statistics for technical costing and tariff analysis.

The position is superannuable and the salary will be in accordance with N.J.B. Schedule B, Class AX/DX, Grade 4, £895/£1,110 per annum.

Applications should be made on the standard form, which may be obtained from the undersigned, and should reach this office not later than 28th September, 1957. Please quote reference No. C5/57.

ANDREW A. WALLACE,
Secretary.

P.O. Box 173,
351, Sauchiehall Street,
Glasgow, C.2.
31st August, 1957. 7435

LONDON ELECTRICITY BOARD

Engineering Draughtsmen

APPLICATIONS are invited for the following superannuable and permanent appointments. The posts are graded under Schedule D of the National Joint Board Agreement as Grade 6, £635 to £735 per annum, inclusive of London allowance.

ENGINEERING DRAUGHTSMEN for electrical plant layout in the Drawing Office of the CHIEF ENGINEER'S DEPT., in Central London. Applicants should preferably have served an engineering apprenticeship and have had technical training to Ordinary National Certificate level, together with experience in the layout of H.V. transforming plant, switchgear and cables. (Vacancy No. 2372/R.)

ENGINEERING DRAUGHTSMAN in the SOUTH EASTERN DISTRICT at Woolwich, London, S.E.18. Applicants should have a good general and technical education, and also experience in layouts of substations and transformer chambers for voltages up to 11 kV, site plans and mains records. (Vacancy No. 2274/R.)

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed by 28th September, 1957. Please quote appropriate vacancy number of post for which the application is made. 7408

LONDON ELECTRICITY BOARD

Assistant Secretary

APPLICATIONS are invited for the appointment of an ASSISTANT SECRETARY at the Board's Headquarters in Central London.

Candidates should have wide experience of secretarial and administrative work in the electricity supply industry. The duties of the post will include secretarial service to the Board and its committees, the preparation of reports and responsibility for matters of general administration.

The post has been allocated provisionally to Grade 5, Class C, of the revised agreement of the National Joint Managerial and Higher Executive Grades Committee, this being subject to ratification by the Board and subsequently the National Council, but the commencing salary will not be less than £1,960 per annum, inclusive of London Area allowance.

Applications, stating age, qualifications, experience, present position and salary, should be forwarded to the Secretary, London Electricity Board, 46, New Broad Street, London, E.C.2, so as to be received by 30th September, 1957. 7452

EASTERN ELECTRICITY BOARD

Northmet Sub-Area

118/57.R.

GENERAL ASSISTANT ENGINEER, Sub-Area Construction Department (ref. 717). Candidates should have had a sound technical training to Higher National Certificate standard.

The successful applicant will be required to assist in the supervision of cable laying by direct and contract labour, and of jointing on all classes of cable up to and including 33 kV.

Salary N.J.B. Class M, Grade 17 (£685-£730) plus London allowance.

The successful applicant will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Apply by letter to C. C. Hill, B.Sc.(Eng.), M.I.E.E., M.I.Mech.E., Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14, by 23rd September, 1957. 7474

VENNER LIMITED

ELECTRICAL ENGINEERS (Laboratory) required with experience in development of electro-mechanical instruments. Time-switch experience an advantage.

Salaries and conditions for these staff vacancies are in line with the responsibilities involved, and there is a pension scheme.

Fully detailed applications should be addressed to Personnel Manager, VENNER LIMITED, Kingston By-pass, New Malden, Surrey. 7338

B I C C

THE Submarine Power Cable Contracts Department of British Insulated Callender's Construction Co. Ltd. has the following vacancies at their Trafford Park, Manchester, offices:

ESTIMATOR required to assume responsibility for the preparation of quotations for submarine power cable installations at home and overseas. Applicants should have experience of underground power cable contract estimating and have the necessary imagination and versatility to apply their knowledge to submarine cable work.

DRAUGHTSMAN with a general knowledge of mechanical engineering to at least O.N.C. is required for work including the design of special plant for submarine cable installations.

Apply in writing to Personnel Officer (Staff), British Insulated Callender's Construction Co. Ltd., 30, Leicester Square, London, W.C.2. 7429

SENIOR AND JUNIOR ENGINEERS

are required immediately for interesting work in connection with an intensive development programme which is being undertaken by an electrical firm in the North West of England.

The programme includes measuring instruments and protective and control relays. Openings are available both in the design and application sections.

Applicants should have a degree or a Higher National Certificate, or equivalent, in electrical engineering, and whilst experience is desirable, training will be given to suitable applicants.

Salaries, commensurate to those paid elsewhere to professional engineers, will be in accordance with age and experience, and they are reviewed frequently.

These positions are permanent and the amenities include good canteen facilities, medical services and an excellent contributory pension and life assurance scheme.

Applicants should write in confidence, giving full particulars of age, experience and qualifications to—Box 7372.

WELSH COLLEGE OF ADVANCED TECHNOLOGY

Principal: A. Harvey, Ph.D., B.Sc., F.Inst.P.

Department of Electrical Engineering

APPLICATIONS are invited for two posts as LECTURER on the salary scale £1,200 × £30 to £1,350 p.a. Candidates should possess a university degree, together with teaching and industrial experience. Preference will be given to candidates qualified to teach in the field of electrical power.

Forms of application, together with further particulars, may be obtained from the Principal, Welsh College of Advanced Technology, Cathays Park, Cardiff, on receipt of a stamped addressed foolscap envelope.

ROBERT E. PRESSWOOD,
Director of Education and
Clerk to the Governors.

City Hall,
Cardiff. 7407

ELECTRICAL ENGINEER

required (aged 30-45, preferably Chartered), to assume progressive leading position, at attractive commencing salary, in design office of London company. Applicants must be fully conversant with low and medium voltage automatic contactor gear, motors, relay systems, and methods of temperature control. Previous D.O. experience and a thorough knowledge of wiring systems applied to precision machinery is essential. Write in first instance—Personnel Manager, Molins Machine Co., Ltd., Evelyn Street, London, S.E.8. 7485

SENIOR TECHNICAL SALES ENGINEERS

required to introduce and sell fluid power transmission equipment to those manufacturers who make and want the best.

Applicants should have matriculation standard, have good engineering background, possess intimate knowledge of mechanical processes combined with electrical drives and transmissions; age approx. 40.

Give full details of education, qualifications and experience, stating branch of industries and firms concerned and present salary.—Box 7229.

SOUTH WALES ELECTRICITY BOARD

ASSISTANT DISTRIBUTION CONTROL ENGINEER (Shift Duties) required at the Board's Control Centre at Upper Boat.

Duties will involve assisting the Control Engineer (Shift) in the operation of an extensive overhead and underground high-voltage network, and applicants should have experience in the operation of high-voltage switchgear, transformers and associated protection equipment, and be familiar with the working of the safety rules.

Salary Class AX/DX.5 (£810/£1,010) (plus 10% shift enhancement) of the N.J.B. Scheaule.

Applications stating age, present position and salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Monday, 23rd September, 1957. 7451

AUTOMATIC TELEPHONE & ELECTRIC COMPANY LTD.

Liverpool

COMMERCIAL ENGINEERING DEPARTMENT

A.T. & E. Co. have several vacancies in the Commercial Engineering Department at Liverpool, for men with good technical background and experience in telephone exchange equipment and systems.

This department deals with the planning of telephone exchanges and networks, the preparation of specifications and estimates, and the development of projects and proposals to meet customers' requirements.

Posts are on permanent staff, with generous contributory pension fund, and all modern amenities. Assistance with removal, and housing, will be given in approved cases.

Write giving full details of age, qualifications and experience to—

Personnel Manager
A. T. & E. CO. LTD.
Strowger Works, Liverpool, 7

7437

ELECTRICAL ENGINEER

required for experimental and test work connected with the design and development of ignition equipment for gas turbines. Applicants should have Higher National Certificate and some workshop experience. Ability to construct rough prototypes is desirable.

The position provides an interesting opportunity in a new and developing field with good prospects for advancement. Five-day week. Staff pension fund.

Apply in writing, stating age, qualifications and experience to — The Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/166.

7438

BRITISH KLOCKNER SWITCHGEAR LIMITED

Chertsey, Surrey

ESTIMATOR for TECHNICAL SALES. Correspondence and capable of preparing control schemes involving automatic motor control gear. Experience essential.

CIRCUIT DIAGRAM DRAUGHTSMAN. Preferably experienced in preparing automatic control gear schemes.

Applicants to have O.N.C. (Electrical). Excellent opportunities with fast growing concern. Pension scheme. Apply to Managing Director, stating experience and present salary. 165

AIR MINISTRY

WORKS Designs Branch requires in London and Provinces ELECTRICAL ENGINEERING DRAUGHTSMEN experienced in preparation of schemes for illumination and electrical equipment of buildings or in electrical distribution, H.V. and M.V. Technical training to O.N.C. standard or equivalent an advantage.

Salaries in London up to £1,015 per annum. Somewhat lower in Provinces. Starting pay dependent on age, qualifications and experience. Long-term possibilities with promotion and pensionable prospects. 5-day week. 3 weeks' 3 days' leave a year. Liability for overseas service. Normally natural-born British subjects.

Write stating age, qualifications, employment details including type of work done, to any Employment Exchange, quoting Order No. Borough 604. 260

ELECTRICAL ENGINEER

of degree standard required for development work on ignition apparatus, including coils and capacitors, and of electronic equipment. Applicants should be not less than 25 years. Previous industrial experience desirable, preferably on development work. The duties are varied and interesting and provide very good opportunities for promotion. Staff pension fund.

Apply in writing, stating age, qualifications and experience, to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/162.

7453

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

ASSISTANT MAINTENANCE ENGINEER (Electrical) is required at Meaford A Power Station, Nr. Stone, Staffs. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade G8, £885-£930 per annum.

A sound technical training and practical experience in modern power station electrical maintenance is required, and the possession of appropriate technical qualifications will be an advantage.

Apply quoting Vacancy No. 634MD, on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 25th September, 1957. 7478

TRANSFORMER DRAUGHTSMEN

SENIOR and JUNIOR DRAUGHTSMEN with experience on power transformers in range 5 to 10,000 kVA required. Permanent positions offering good salary according to experience. Pension, life assurance scheme, etc. Evening and Saturday interviews can be arranged.

Write stating age, experience and qualifications to:—

Chief Engineer,
BRYCE ELECTRIC CONSTRUCTION CO. LTD.,
Kelvin Works, Hackbridge, Wallington, Surrey.

7317

BRITISH KLOCKNER SWITCHGEAR LIMITED

Chertsey, Surrey

TECHNICAL SALES ENGINEERS required for London and Home Counties. Knowledge of motor control gear; sales experience preferred but not essential. Apply giving full particulars to—Managing Director. 166

A POWER house superintendent is required for a Tanganyika gold mine. Experience on the running and maintenance of Crossley-Premier diesel engines desirable. Salary up to £115 per month. Quarters and principal items of furniture provided. Healthy climate. Apply Box No. 1141, c/o Charles Barker & Sons Ltd., Gateway House, London, E.C.4. 7455

***Situations Vacant** (continued)*

A FIRST-class sales engineer for Scotland is required in the field of electrical insulation. Candidates should have experience in the manufacture of electrical power plant and hold H.N.C. or equivalent. Residence in Glasgow area will be required. This is a permanent pensionable position with an established company, and provides salary, expenses and a car. Write, in confidence, giving details of age, experience, qualifications, salary, etc.—Box 7439.

ARMATURE winder charge hand to supervise winding department of small electric motor repair shop, employing mixed labour.—Shoolbred Rewinds Ltd., 1, Langley Street, Luton. 7487

ARMATURE winder required with ability to supervise small repair shop. N.E. London area.—Box 7318.

ASSISTANT protection engineers for Nairobi, Kenya Colony. Experienced in commissioning, testing and maintenance of protection devices associated with generation transmission and distribution. Preference given to holders of qualifications equivalent to Grad. I.E.E., with sound practical experience in electrical engineering. Commencing salary £960/£1,220 per annum (including local allowance). Free housing (including heavy furniture), electricity, passages and family medical benefits. Contributory pension and insurance scheme and non-contributory dependants' benefit scheme. Write details age, qualifications and experience to—London Secretary (I.A.M./22), East African Power & Lighting Co. Ltd., 66, Queen Street, London, E.C.4. 7440

ASSISTANT storekeeper (male) required. Age not important. Apply—W. L. Turner & Co., Electrical Wholesalers, 64, Victoria St., London, S.W.1. 7421

BIRLEC Limited have a vacancy for a young qualified electrical engineer (degree, H.N.C. or equivalent standard) for design work in connection with all classes of electric furnaces. Progressive position for suitable applicant, who will be remunerated accordingly, with participation in free pension scheme. Apply Personnel Manager, Birlec Limited, Tyburn Road, Birmingham, 24. 7441

BOOTS PURE DRUG Co. Ltd., require two electrical engineering draughtsmen, age 25-30 years. Commencing salary up to £750 per annum according to qualifications and experience. Five-day week, superannuation scheme. Applications in writing to—Personnel Manager, Station Street, Nottingham. 7395

BRANCH manager required in Southampton area by national wholesaler. Applicants should have an industrial background in selling and experience of administration in wholesaling. Remuneration by salary and commission. Superannuation scheme. Apply in own handwriting to—Box 7456.

CABLE company requires technical engineer for super-tension cable schemes development. Knowledge of oil-filled cables an advantage and must be able to formulate detailed technical instructions. Applicants should have technical qualifications of at least H.N.C. standard in electrical engineering.—Box 7442.

CROMPTON PARKINSON Group requires two young engineers for special duties in their Overseas Division (London). The work will include commercial liaison with the company's home and overseas factories and the world-wide marketing facilities and will provide excellent scope for a really go-ahead young man. A background knowledge of switchgear and transformers is desirable but not essential. Applications, including details of education, experience and salary required, should be sent to Ref. SXP, Crompton Parkinson Ltd., Crompton House, Aldwych, London, W.C.2. 7422

DESIGNER draughtsmen, age 25-40, required by electrical control gear manufacturers in South East England. A sound technical knowledge and practical experience in design of contactors and relays are essential. Staff pension scheme, five-day week, salary in accordance with age and experience. Applications in writing, stating qualifications, experience and salary required, should be sent to—Box 7396.

CLASSIFIED ADVERTISEMENTS

ARE PREPAID

DIRECTORSHIP offered to a candidate possessing an extensive knowledge of electrical contracting for substantial size London company of electrical contractors. Ability to control a large volume of work, and interviewing prospective clients at director level. Policy and directive control an essential qualification. Salary and percentage of profits, region £2,500 p.a., with prospects of advancement. Written application—Laurie & Co., Employment Specialists, 19, Basinghall St., London, E.C.2. 9112

ELECTRICAL and electronic instrument engineer of ability and initiative required for works in Central London. Candidates should be under 35 years of age and must have received a first-class education, preferably to degree standard. Preference will be given to one having served an apprenticeship in the manufacture of electrical measuring instruments. Applicant chosen would at first be responsible to the managing director for design and development work, and later act as his personal assistant, prior to executive status. Apply in confidence, stating qualifications, experience and present salary, to the Secretary, White Electrical Instrument Co. Ltd., 10, Amwell Street, London, E.C.1. 7415

ELECTRICAL contractors (Liverpool) require a draughtsman preferably with practical experience and with knowledge of planning and scheme work for installation contracts. Apply in writing stating age, previous experience and salary required.—Box 7489.

ELECTRICAL contractors (Liverpool) require estimating engineer. Write stating age, previous experience and salary required.—Box 7490.

ELECTRICAL contractors (Liverpool) require supervisor with estimating experience and capable of supervising large installation contracts. Apply in writing stating age, previous experience and salary required.—Box 7488.

ELECTRICAL contractors, old-established, in London, require senior engineer of experience with knowledge of estimating. Write stating age, experience and salary required to—Box 7431.

ELECTRICAL contractors require supervising engineer to handle wiring contracts from estimating to final billing, Lowestoft area. Fine opportunity with big prospects leading to directorship for energetic young man (22-40) with sound practical and technical knowledge, able to interview and advise clients and also seek out business. Reply in confidence, stating experience, age and commencing salary.—Box 9114.

ELECTRICAL draughtsman with experience of large transformer tank design and detailing up to 10,000 kVA required by consultants in London, S.W.1. Good mechanical draughtsmen who wish to specialise in this work will be given training in this expanding business with a stable future. Excellent salaries paid to experienced men with A.E.S.D. rate as minimum. Seniors and juniors are asked to apply to—Box 7414.

ELECTRICAL engineer required by electrical contracting company for service in British West Africa. Must have experience on preparation of specifications and estimates and supervision of contract work. Remuneration between £1,300 and £1,600 p.a. depending on qualifications and experience. Tours normally 20 months followed by 4 months' leave with free passages. Pension scheme, family allowances and free furnished quarters in Africa. Please write giving age, whether married or single, and brief details of education, qualifications and experience, to—Box 7423.

ELECTRICAL engineer for the Power Cables Division, Erith, for duties in systems engineering department. Candidates should be qualified to at least Grad. I.E.E. level, preferably A.M.I.E.E., and should have good general knowledge of power cables, especially of fundamental calculations of current-carrying capacity. The department is responsible for providing all technical information and recommendations required as a basis for tenders for power transmission and distribution cables of all voltages. Salary commensurate with experience in this field. 5-day week. Pension fund and staff bonus. Applications invited to Staff Officer, BICC Ltd., Erith Works, Belvedere, Kent. 7425

ELECTRICAL engineer required for development of electrical control equipment. Knowledge of photo-electric, transistor and magnetic amplifiers desirable. Appointment carries superannuation benefits and good prospects. Apply stating qualifications to—Aish & Co. Ltd., Vanguard Works, Poole, Dorset. 7416

ELECTRICAL engineer, graduate, required for the research laboratories of British Insulated Callender's Cables Ltd., Shepherds Bush, London, W.12. The work involves research and development of vacuum metallising processes, instrumentation and measurement of electrical properties of capacitor components. Special experience in vacuum technology would be desirable but is not essential. Five-day week. Pension fund. Applications giving details of age, qualifications and experience should be made to Manager (Personnel), BICC Limited, Norfolk House, Norfolk Street, London, W.C.2, reference W.L.14. 7457

ELECTRICAL engineering assistant required with experience of lift practice. Salary up to £817 (under review). Application form from Chief Engineer (57/54), London County Council, County Hall, London, S.E.1. (1655) 7459

ELECTRICAL installation engineer. Estimating, planning and supervision. Write giving details of experience, etc., to—Priory Electric Service (Coventry), Ltd., 3, Lower Ford Street, Coventry. 7397

ELECTRICIANS required for day and shift work on maintenance of paper mill plant. Good rates of pay and proficiency bonus. Sick benefit and contributory pension schemes. Canteen and sports facilities. — Bowaters United Kingdom Pulp and Paper Mills Limited, Thames Division, Northfleet, Kent. 7417

ESTABLISHED electrical contractors (Flintshire coastal town) require manager's assistant. Applicants must have sound contracting technical training and be capable of estimating, costing, and able to give site supervision. Write giving age, qualifications, experience and salary required.—Box 7443.

ESTIMATING engineer required, used to A.C. and D.C. switchgear, open and enclosed pattern switchboards. Apply to—Whipp & Bourne Ltd., Switchgear Works, Castleton, Rochdale. 7360

EXPERIENCED man required with full knowledge of the design and manufacture of domestic electric cookers. Position calls for imagination and drive and very considerable organising ability. Excellent opportunity for man, preferably under 45, with the necessary qualifications. Write full details, including salary expected.—Box 7458.

FIRST-class sales representative for Greater London area. Apply with details of personal history and qualifications to — Sales Manager, Berry's Electric Ltd., 86, Newman Street, London, W.1. 7334

FOREMAN supervisor electrician required for factory, commercial and domestic installations. Write giving details of experience, etc., to—Priory Electric Service (Coventry), Ltd., 3, Lower Ford Street, Coventry. 7398

FOREMAN winder to take entire charge of established repair shop. Write giving details of experience, etc., to—Priory Electric Service (Coventry), Ltd., 3, Lower Ford Street, Coventry. 7399

INSPECTOR for electrical work required with experience of lifts. Rate of pay 275s. p.w. Application form from Chief Engineer (57/65), London County Council, County Hall, London, S.E.1. (1656) 7460

JOINTER, first-class cable, fully experienced H.T. and telephone work, required by large London firm electrical engineers. Excellent opportunity. Write experience, references.—Box 7248.

MANAGER assistant, 25-35 years, required by electrical contractor (med. size) engaged on building installations, to handle all internal technical and office procedures. Good draughtsman able to prepare schematic layouts and experienced estimating, buying, etc. Pension scheme. Excellent opportunity. State age, experience and salary required.—Box 7400.

PRODUCTION engineer required with good experience of coil winding problems, also up-to-date knowledge of winding techniques associated with telecommunication industry. London area. Write, giving full details of experience, etc., to—Box 3R F 03775, A.K. Advg., 212a, Shaftesbury Av., London, W.C.2. 7467

SALES engineer required for Midland area by Birmingham firm of control gear makers. Age 25-35. Must have had works apprentice training and hold as a minimum O.N.C. (electrical). Car provided. Attractive salary and working conditions. Write stating age, experience and salary required to—Box 7362.

SALES representative. An old-established Midlands manufacturer of domestic appliances is about to enter the electrical field with an entirely new appliance. This venture creates a vacancy which it is urgently necessary to fill with a keen, enthusiastic and progressive man, aged 28/32, who is thoroughly experienced in Electricity Authority Boards. Initially the area the wholesale electrical trade and the Central to be covered is Greater London, and a car will be provided as the area may later be extended. The company is only interested in applications from men of proved experience and ability and is prepared to pay a good salary. Applications, in confidence, giving full details of age, experience and salary to—Box 7461.

SENIOR draughtsman with first-class design experience in switchgear, overhead and substation equipment to take charge of D.O. H.N.C. or equivalent desirable but not essential. Salary commensurate with experience and qualifications. Write stating age, education, qualifications and experience to—The General Manager, Electric Transmission Ltd., Newstead, Trentham, Stoke-on-Trent, Staffs. 7444

SITUATION available for senior switchgear designer experienced in the general mechanical and electrical design work associated with high-power switchgear and circuit breakers up to 132 kV. Previous experience on the lines indicated preferable, but design experience on associated equipment will be considered. Applications giving age, education and full details of experience, together with salary required, to the Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. 7445

SOUTH WALES ELECTRIC (Pty.) Ltd., the S.A. representatives of South Wales Switchgear Ltd., require an assistant sales engineer to handle switchgear and transformer tenders to 33 kV. Salary £1,000 per year. Pension fund. For further details write by Air Mail to—P.O. Box 2180, Johannesburg, S.A., giving details of experience, age and marital state. 9119

TECHNICAL assistant required by expanding electrical manufacturers in the Midlands to assist with estimates and contracts. Higher National Certificate or Graduate I.E.E. preferred but not essential. Excellent prospects and pension scheme. Write stating age, qualifications, experience and salary required to—Box 7424.

TECHNICAL assistant required with H.N.C. or degree in physics or electrical engineering, to deal with various aspects of development of power capacitors and the use of a surge-generator of 1½ M. volts. The post also provides a good opportunity for experience in the high-voltage field in connection with the testing of power transformers up to 15,000 kVA. Apply in writing in the first place to—Chief Engineer, Bryce Electric Construction Co. Ltd., Kelvin Works, Hackbridge, Wallington, Surrey. 7278

TECHNICAL representation London area for keen experienced young man for progressive manufacturers of heat exchangers and vessels for electricity, steam, hot water and liquid fuels. Salary, turnover bonus and car allowance. Please write stating age, qualifications, experience and remuneration expected.—Box 7418.

TRANSFORMER designer required, preferably experienced in high-voltage test and instrument transformer design. The vacancy offers considerable scope for a person with initiative and drive, interested in dealing with a large range of design problems. If required, help with housing could be arranged. Apply giving details of past experience, age and salary required to Personnel Officer, Foster Transformers Ltd., South Wimbledon, London, S.W.19. 7446

TRANSFORMER designer (senior) required. Applicant must have wide experience in design and manufacture of units up to 250 kVA. Promotion to directorship offered after qualifying period with commensurate salary and bonus. Housing accommodation if required. Replies will be treated in strict confidence.—Stewart Transformers Ltd., 75, Kilburn Lane, London, W.10. 7493

TRANSFORMERS & RECTIFIERS Ltd., Millmead, Guildford, Surrey, require a designer for units up to 500 kVA. An excellent opportunity exists for a man who is looking for a situation with really good prospects in an expanding business. Applicant with a good general knowledge may eventually also undertake rectifier work. Housing assistance. Good salary. Reply in confidence. 7282

WORKS manager required for small manufacturing electrical engineers. Experience in switchgear and heating equipment. Progressive position for right applicant. Must be resident in Leeds area.—Box 7491.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

ASSISTANT sales manager, now with leading London wholesaler seeks new appointment. Wide experience, now responsible for entire internal administration, including buying and order departments. Possesses drive and imagination. Age 27. Free 1st October.—Box 9107.

EASTERN Counties. Young middle-aged experienced representative, good connections all aspects electrical trade, seeks position with firm of repute.—Box 9099.

ELECTRICAL engineer, C. and G. Certificate, requires post as representative, Leicester area, as additional line 20 hours week approx. Conversant with domestic, industrial, elect. lift engineering. Vehicle owner and phone installed.—Box 9115.

ELECTRICAL engineer, fluent English, German, French, 2 years' sales engineering, 4 years' experience continental installation, power engineering, electrification schemes of public buildings and factories, seeks technical or administrative position with consulting, contracting engineering or export firm.—Box 9106.

FOREMAN electrician, A.M.A.S.E.E. (32). Present contract expiring October, seeks similar position contracting, installations, maintenance or trouble shooting anywhere, home or abroad. Salary four figures or payment by results. What offers?—D. J. Hunt, 8, Wootton Green, Wootton, Beds. 9116

MANAGER, electrical contracting, seeks executive position with prospects in London area or Southern England. Extensive technical, commercial and administrative knowledge and experience.—Box 9120.

QUALIFIED elec. engr., G.I.E.E., G.I. Mech.E., seeks responsible position as tech. engr. or tech. sales engineer. Experienced design, contract, installations, etc., large industrial distribution, power, lighting schemes. Exp. handling equiries to final accounts.—Box 9101.

REPRESENTATIVE (45), wide experience electrical and non-ferrous precision eng. trades, seeks change. London based. Contacts with elec. wholesalers, contractors, elec. boards, gas boards, manufacturing engineers, etc.—Box 9103.

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Twenty-sixth Sale **E. R.**

By Order of the Secretary of State for Air

R.A.F., STAFFORD
(on the main Sandon road, 2 miles from Stafford Centre).

SOUTH & STUBBS

are favoured with instructions to Sell by Auction on

WEDNESDAY, 25th SEPTEMBER, 1957,
at 11 a.m.
at "B" Camp, H.Q. Site, R.A.F., Stafford,
a large quantity of

SURPLUS GOVERNMENT STORES

lying at R.A.F., Stafford, sub-site Hixon, R.A.F., Sutton Coldfield, Stoke Heath, Salop, and A.M.W.D., Lichfield, including Radio and Aero Spares, Engine Spares, M.T. Spares and Tools, Caterpillar Tractor Spares, David Brown Tractor Spares and Accessories, Transformers, Wood Cases, Morris Motor Spares, Power Units, Girders, Barrack Furnishings, Ovens, Stoves, Trusses, Bicycle Spares, Outer Covers, Tyres, Wheels, etc., in all 627 lots.

View Days—see Catalogue.

Catalogues, 6d. each (P.O. only) from the Auctioneers.

Auctioneers' Offices: 28, Eastgate Street, Stafford (Tel. 2331/2).

7447

Thirty-fourth Sale **E. R.**

By Order of the Minister of Supply

M.O.S. STORAGE DEPOT, RUDDINGTON
(Five miles south of Nottingham on the main Nottingham-Loughborough road)

WALKER, WALTON & HANSON
(in association with
TURNER, FLETCHER & ESSEX
and
RICHARDSON & LINNELL)

will Sell by Auction on

THURSDAY & FRIDAY, 26th & 27th SEPTEMBER, 1957, at 10.30 a.m.

a Large Quantity of

GOVERNMENT SURPLUS PLANT AND STORES

including Newall Plain Grinders, Scrivener Centreless Grinders, Herbert No. 6 Smallpiece Lathes, Archdale Vertical Miller, Kitchen & Wade Radial Drill, Robot and Snow Surface Grinders, Gisholt Turret Lathes, Herbert and Kitchen & Wade Drilling Machines, Cincinnati Miller, Herbert Flash Tapping Machine, Noble & Lund Band Sawing Machine, Webb Radial Drilling Machine, Hicycle Drills, Berthiez Duplex Boring Machines &c., Textiles, Clothing, Laces, Boots and Shoes, Leather Slippers, Rubber Knee Boots, Gloves, Mittens, Sheepskin Lined Mitten/Gloves, Pyjamas, Shirts, Overalls, Smocks, Foundation Garments, Handkerchiefs, Buttons, Buckles, Oilskin Capes and Trousers, Razor Blades, Scrap Hessian, Canvas Covers, Webbing, Bivouac Tents, Portable Cookers, Ball and Roller Bearings, Tyres, Brushes, Matchets and Sheaths, Rivets, Dynamos, Starter Motors, Winches, Portable Charging Sets, Sparking Plugs, Radiators, Electric Furnaces, Washing Plants, Electrical Spares, M.T. Spares, Steel Wire Rope, Diesel Engines, Rear Axles and Gear Boxes, Gravity Roller Straights, Fire Pump Spares, Mild and Free Cutting Steel, Decauville Turnouts, Continuous Burning Fires, Corrugated Curved Steel Sheeting, etc.

ON VIEW: Thursday, Friday, Monday, Tuesday and Wednesday, 19th, 20th, 23rd, 24th and 25th September, 9 a.m. to 4.30 p.m. and mornings of Sale, 9 a.m. to 10.15 a.m.

CATALOGUES, price 6d. each (P.O.s only), to admit TWO PERSONS to View and ONE PERSON to the Sale, may be obtained from the Auctioneers' Offices, Byard Lane, Bridlesmith Gate, Nottingham (Tel. Nottingham 47271, 5 lines). 7419

Thirtieth Sale **E. R.**

By Order of the Secretary of State for Air

No. 25 MAINTENANCE UNIT, R.A.F., HARTLEBURY, WORCESTERSHIRE
(4 miles from Kidderminster, 11 miles from Worcester).

NOCK & JOSELAND

are instructed to Sell by Auction at the above Unit on

THURSDAY, 19th SEPTEMBER, 1957,
at 11 a.m. prompt,

a Large Quantity of Valuable

MISCELLANEOUS STORES

including Clothing and Equipment, Parachutes and Dinghies, Cameras and Photographic Equipment, RADIO AND ELECTRICAL EQUIPMENT, Footwear and Repair Materials, Metal Fittings, General Stores.

VIEWING: The Lots are on view at Hartlebury on Wednesday, 18th September, 1957, between the hours of 9 a.m. and 4 p.m., and on the morning of the Sale Day between the hours of 8 a.m. and 11 a.m.

Admission by Catalogue only, price Sixpence each (postal orders, NOT stamps), which can be obtained from the Auctioneers:—

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Bank Buildings, Kidderminster
(Tel. 2053 & 4211) 7375

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ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.
ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

ABABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- Slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

ALUMINIUM, brass and copper in sheets, rods, tubes, angles, etc. Sheared blanks a speciality. Approved stockholders. For immediate attention, phone or send your inquiries—R.D.C., 100 Hampstead Rd., London, N.W.1 (EUSton 5176/7). 352

BARGAINS in electric motors are always being obtained from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Stocks include A.C. and D.C. motors, second-hand and new up to 30 h.p. Starters, slide rails and pulleys. Ring Mon. 3355 for your requirements. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

BRAND new and unused Evershed & Vignoles series 1 bridge Megger testing set, Cat. No. 35059. Testing 1,000 volts, range 0/100 megohms, with 4-dial resistance box adjustable 1/9999 ohms. To-day's list price £189 10s. Offered with immediate delivery at the unrepeatable sum of £120 net.—J. H. Elsby, Market St. West, Birkenhead (Tel. 3192). 7178

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (Ealing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, 110 and 220 v. D.C./230 v. A.C., .5 to 6 kVA; also A.C./D.C. Special voltages at short notice.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk. London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRICAL sheet steel offcuts for sale, all grades, plain or insulated. Quantities large or small.—Box 7427.

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

ELSBY for most types and sizes of Niphan, L & P, and similar pattern watertight plugs, sockets, switches, switchplugs, etc.—J. H. Elsby, Market St. West, Birkenhead (Tel. 3192). 7179

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues.—The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FOR contact studs, pole shoes, semi-tubular and special rivets, shouldered pins. All orders promptly executed by S.B.W. (Cold-heading) Ltd. Sole selling agents, B.M.B. (Sales) Limited, High Street, Crawley, Sussex. 7492

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FRACTIONAL h.p. motors, new, ex stock, A.C./D.C., Universal, B.T.H., Delco-Remy, G.E.C., Fracmo, Newman, Scophony.—Jeary Electrical Co. Ltd., 5, Lamb's Buildings, London, E.C.1. 126

GENERATING plants, remote and M/F up to 10 kVA; also secondhand A.C. and D.C. sets up to 100 kVA, large stock all types. Special plants built at short notice.—Powerco Ltd., 312, York Road, London, S.W.18 (Tel. VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW. A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station works, Bishop's Stortford. 161

GEORGE Ellison oil-immersed auto-transformer starter, 250 h.p., 400 volts, 3-ph., 50 cycles.—Whitefield Machinery & Plant Ltd., Cobden St., Salford, 6 (Tel. PEN. 4746). 305

HOUSE service meters, C. & H., Aron, E.A.C., 20-240 v. A.C., s.-ph., 50 c., 2½ amps., 7s. 6d. each, 1s. 6d. postage; 5 amps., 17s. 6d.—Universal Electrical, 217-221, City Road, London, E.C.1. 37

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTORS, starters, circuit-breakers. Huge stocks of all types, ½ to 300 h.p. Stock list or quote by return.—J. S Ramsbottom & Co. Ltd., Electrical Engineers, Keighley (3774-5-6). 70

NAMEPLATES, engraving, diesinking, stencils.—Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. or D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

CLASSIFIED ADVERTISEMENTS ARE PREPAID

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters.—Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings. 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY Credit Meters, single & poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

ROTARY converters in stock, all sizes: enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 34

SMALL BA screws and nuts in steel, brass and stainless steel, from stock.—Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

TELEVISION slotmeters & Time Switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

VARIOUS tumbler switches, 6,000, 5-amp., one-way, ex-Govt. Accept reasonable offer.—Box 7462.

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generator sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

500-kVA transformer, unused, 6,600/415 volts, 3-phase, complete with L.T. switchgear.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts. 163

885 new storage cells for sale, heavy duty, 570 amps., ebonite container and sealed covers. Orig. made for Admiralty, packed 4 per wood case for transit. Low price for quantities.—Burleigh Alpine Works, Empire Way, Wembley (Tel. 0211). 324

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service.—Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

RELIABLE, self-contained diesel electric generating sets for hire, 2.5 to 260 kW. Night and day maintenance service. Quotations by return.—Whitetrade Limited, Rochester, Kent (Tel. Chatham 4638/9). 294

ARTICLES WANTED

2,000-H.P. MOTOR

2,000-h.p., 3-phase, 240-270-r.p.m.
Motor wanted.

Full details to
Box 7420.

BRADLEY Redundant Electricals, 74, Eversleigh Rd., London, E.6 (Phone GRA. 2750). London leading clearing house for all redundant electrical stock and equipment, A.C. and D.C. motors, generating plants, welders and diesel sets. Complete factories bought and dismantled if required, also small or large stocks of scrap cable (dismantled if required). Estimates given. 185

CABLE, surplus, wanted. Large quantities single P.V.C. and V.I.R., 1/.044" up to 19/.083" and larger. Also steel/P.V.C. assault wire, and telephone wire.—Box 7090.

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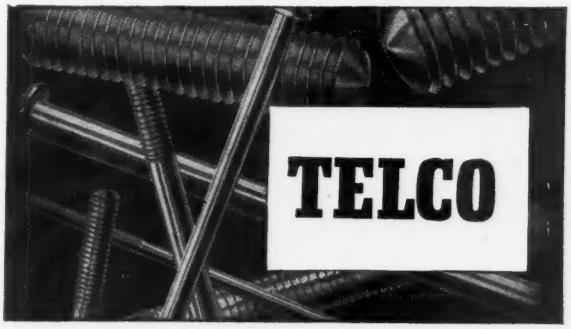

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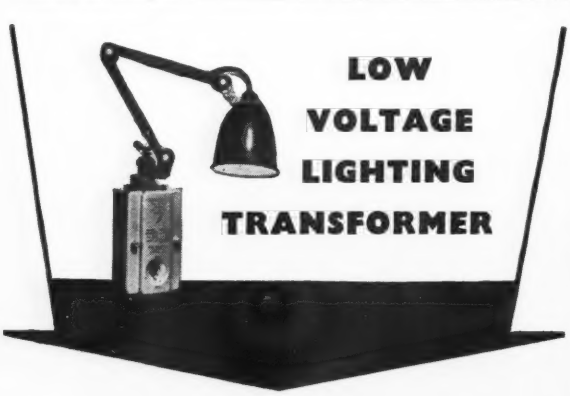

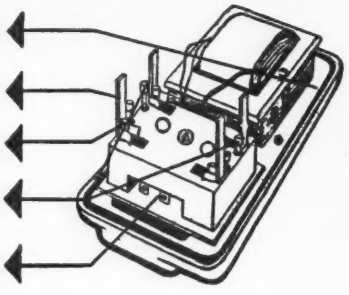

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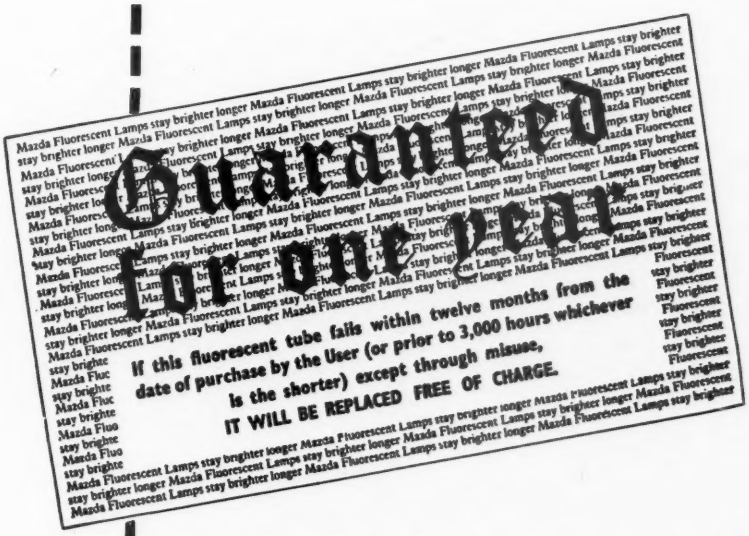
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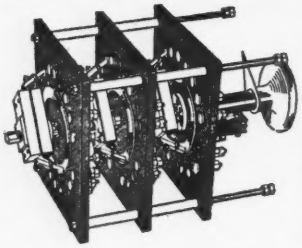

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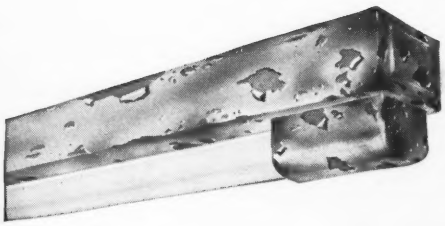

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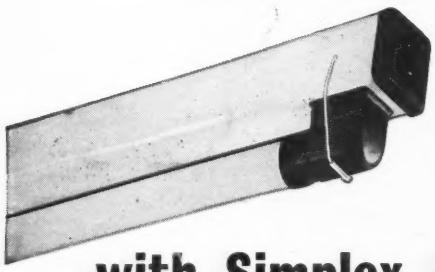

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